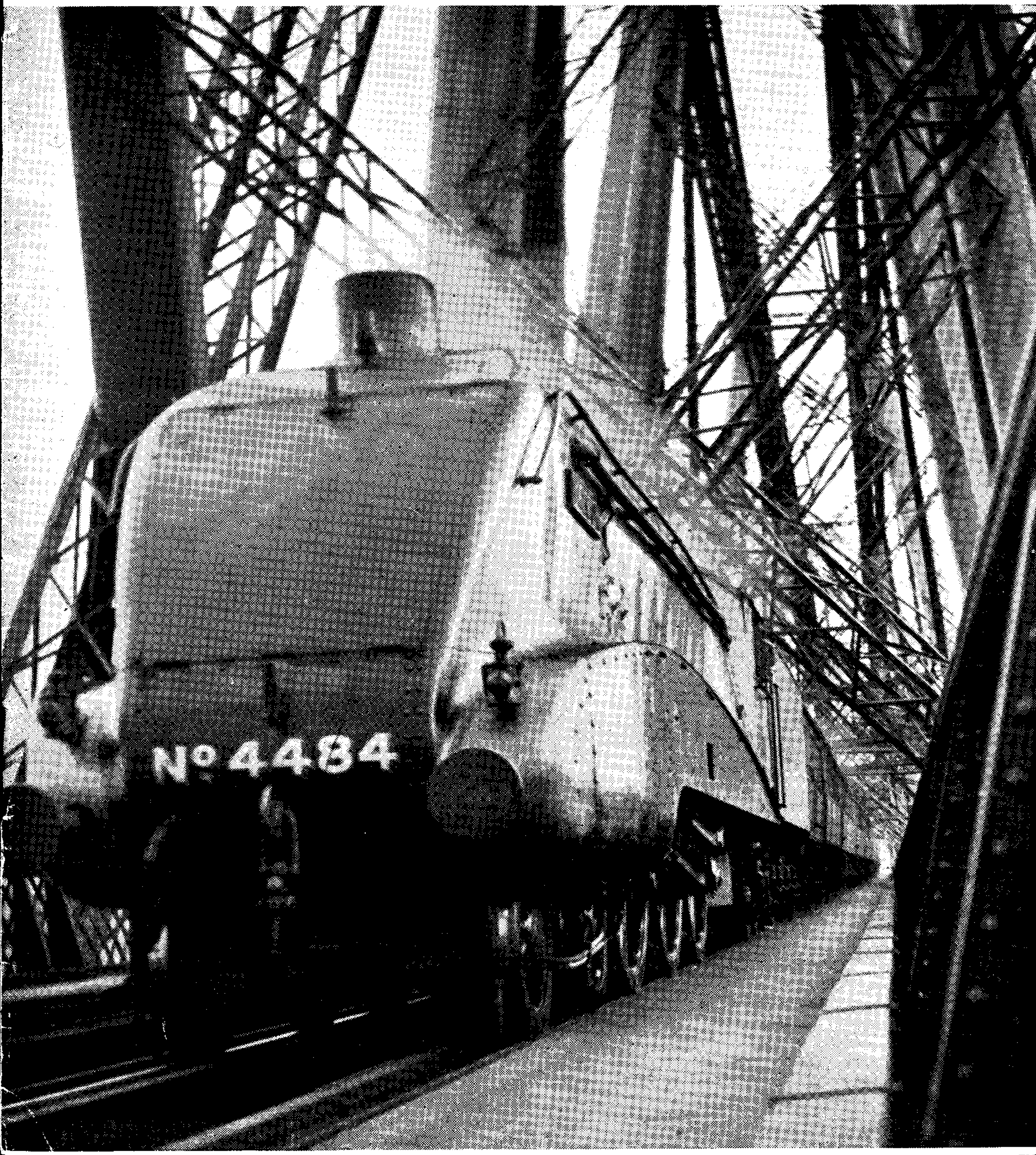
THE MODEL ENGINEER

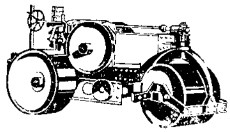
Vol. 96 No. 2399 THURSDAY MAY 15 1947 9d.



The MODEL ENGINEER

Percival Marshall & Co. Ltd., 23, Great Queen St., London, W.C.2

15 MAY 1947



VOL. 96. NO. 2399

SMOKE RINGS

Our Cover Picture

THIS unusual camera study is the first taken of a head-on approaching express train on the Forth Bridge. "Before admitting me on to the Bridge," to quote the camera man's story, "the railway company made me sign an indemnity form. A wave of vibration came travelling towards me as the express approached at 40 miles an hour (the speed limit on the Forth Bridge), mounting to such an alarming crescendo that, when the train came into focus at 10 yards, I was being tossed about in my precarious kneeling position like an airman in a rubber dinghy. I was convinced my photograph was blurred, but the fast camera speed had averted a failure."

A Tribute from New York

MY natural modesty almost forbids the publication of the following tribute from a New York reader, but it is so charmingly spontaneous that I feel it deserves a place in "Smoke Rings." Mr. John Thomson, of South Ozone Park, N.Y., writes :—"When I was a boy, 50 years ago, I visited the town of Airdrie in Scotland, and it was there I first saw THE MODEL ENGINEER. I devoured its pages eagerly, and at that time was born within me a desire to become a stationary engineer to operate engines, boilers, pumps, and refrigeration. I got a job in a factory and there I learned plenty. I want to give you all the credit for my rise in life to the position I now hold, as custodian engineer in one of New York's large school buildings. I am a Civil Service employee, and have been employed by the City of New York for 17 years. To me you have done a great favour by planting the seed within me to be an engineer. Thanking you for everything you have put in your paper, and what it meant to me." I am glad to know that Mr. Thomson has found a niche in life which suits him so well, and in which he has found the happiness which comes from a worth-while job well done. The ladder of success in engineering is a tall one and it has many landings on the way. It is, perhaps not given to us all to reach the topmost rung, but our job in life is what we make it, and, as Mr. Thomson shows, success is within our grasp if we take it when opportunity serves, and have the wisdom to enjoy it.

Developments at Dartford

THE enterprising model engineering section of the Social and Athletic Club of Messrs. J. and E. Hall Ltd., of Dartford, scored a striking success at the recent craftsmanship exhibition, organised by the local Rotary Club. Their members secured the first three places in the engineering competition. During the last summer season, nine track events were held in aid of charitable causes, and these benefited to the extent of £93. The club has a 470-ft. track on its sports ground, and a number of attractive locomotive meetings are being planned. Some of the members have built a working model of Richard Trevithick's recoil engine, which he built in 1815. This is a little-known invention and we hope to illustrate the model in an early issue.

The "Ideal Lathe" Competition

ON publishing the first of the three successful designs in the "Ideal Lathe" Competition, sponsored by Messrs. T. Garner and Son Ltd., of Barnsley, we tender our apologies to readers, and especially to competitors, for the delay in bringing this competition to its conclusion. A number of factors have contributed to the delay, many of them common to all printing and publishing undertakings at the present time, but we would like to say that none of them is attributable to Messrs. Garner, who, in spite of difficulties, have been most helpful. As it is so long since the competition was announced, we remind readers that we are asking their help in judging the three selected designs, which, together with their specifications, appear in this and our next two issues. When you have studied the three designs, we ask you to place them, first, second and third, on a post-card, and if you feel like doing so, we shall be interested if you will also mention which are the particular features which appeal to you, and why. Address replies to the Editor of THE MODEL ENGINEER.

News from Malden

ALTHOUGH much official news of Malden doings has not been in evidence of late, the society has been both busily and profitably occupied, in spite of weather difficulties disturbing some of their outdoor activities. Lectures, film shows, a jumble sale, and a "bits and pieces" evening have provided much indoor interest, and track meetings at Thames Ditton and a boat meeting at the Rushmere Pond have started the outdoor season. In future there will be an official track event at Thames Ditton on the first Sunday on each month, and a boat meeting in the third Sunday in each month at the Rushmere Pond, on Wimbledon Common. A full list of fixtures has been prepared which includes track visits by the S.M.E.E. and the Harrow Society, and a locomotive gala day provisionally fixed for July 13th. The projected dates for the annual exhibition are November 23rd to 24th.

The Magic of the Whistle

DO your ears tingle when you hear a locomotive whistle? Does it conjure up for you a vision of the mighty power of steam and of the rushing of a train into the distance of the unknown? Mr. Nelson W. Burtt of Sharon, Mass., tells me that he had these thrills in his boyhood days, and they decided him to become an engineer. He still listens to the sounds of the railroad with enchanted ears and can readily distinguish the notes of the whistles of all the principal American engines. He says :—"Here in Sharon, on the main line of the New Haven between Boston and New York, there are now many diesel-electrics which have rather a flat-sounding note, but there are still steamers and I always cock an appreciative ear when the steam whistle sounds. It will be a sad day when the last steam locomotive whistle sounds. I have been an avowed devotee of the steam locomotive for more years than I like to remember." I am sure the feelings expressed by Mr. Burtt will be echoed in many model engineering hearts in the home country, although we do not have the same variety of whistle tones, nor the same musical whistle chimes, which in the United States charm the ear of the steam locomotive lover. For my own part it is the whistle or the siren of the steamship which has this stimulating effect. The cheeky screech of a tug on the river, or the low boom of a giant liner leaving port equally set my pulses throbbing, and set me longing to be aboard to share the adventures of the voyage. If we are engineers we all respond in some way to the voice of steam, with the magic thoughts it conjures up for us whether these be of our own beloved models, or of their big brothers of the railroad or the sea.

Sociable Staffordshire

THERE is a real "get-together" spirit prevalent among the members of the North Staffordshire Model Society, as a letter from their President, Mr. Thomas Lockett, clearly shows. He tells me a little story of two Post Office officials, both model engineers, who recently found themselves in the Stoke-on-Trent area on special business; they contacted Mr. Ewart Brassington, the hon. secretary of the society, and after he had given them a cordial welcome, he introduced them to Mr. F. S. L. Weston and Mr. Gerald Buck, who also extended the hand of fellowship in right good style. Mr. Lockett says :—"The members of our society feel very strongly that we cannot do too much in encouraging visitors to this area to call on us. Our society meets on the third Monday in each month, at 7.15 p.m., at the offices of the Corporation Electricity Department, 31, Kingsway, Stoke-on-Trent, access being from Back Glebe Street. Mr. Lockett himself may be found at these offices ; Mr. Brassington at 3, Piccadilly, and Mr. Weston, a vice-president, at 71, Kingsfield Oval, Basford." I hope this friendly invitation will be turned to good account.

A Northampton Revival

AN enthusiastic meeting of over one hundred members and friends recently signalised the revival of the Northampton Society of Model Engineers, a society which has distinguished itself in the annals of the hobby by counting no less than four cup-holders among its members. The occasion was notable for the presence of the Mayor of Northampton, Councillor P. C. Williams, Alderman W. J. Bassett-Lowke, and Dr. S. Rowlands, well-known for his beautiful examples of ship-modelling. Mr. Victor B. Harrison gave an instructive address on some of the problems that face model-makers, and on his own experiences in the construction of his admirable collection of railway and ship models. A display of models and a cine-film show added to the attractions of the evening. Councillor J. V. Collier, Managing Director of The Northampton Machinery Co. Ltd., was elected President of the Society.

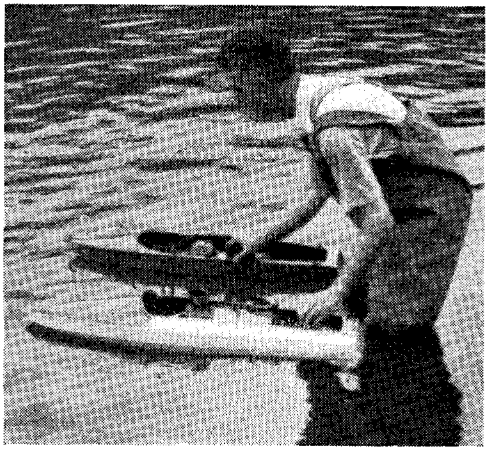
Percival Marshall

NEWS FROM "DOWN UNDER"

DETAILS OF SOME INTERESTING WORK BY A MODEL ENGINEER IN AUSTRALIA

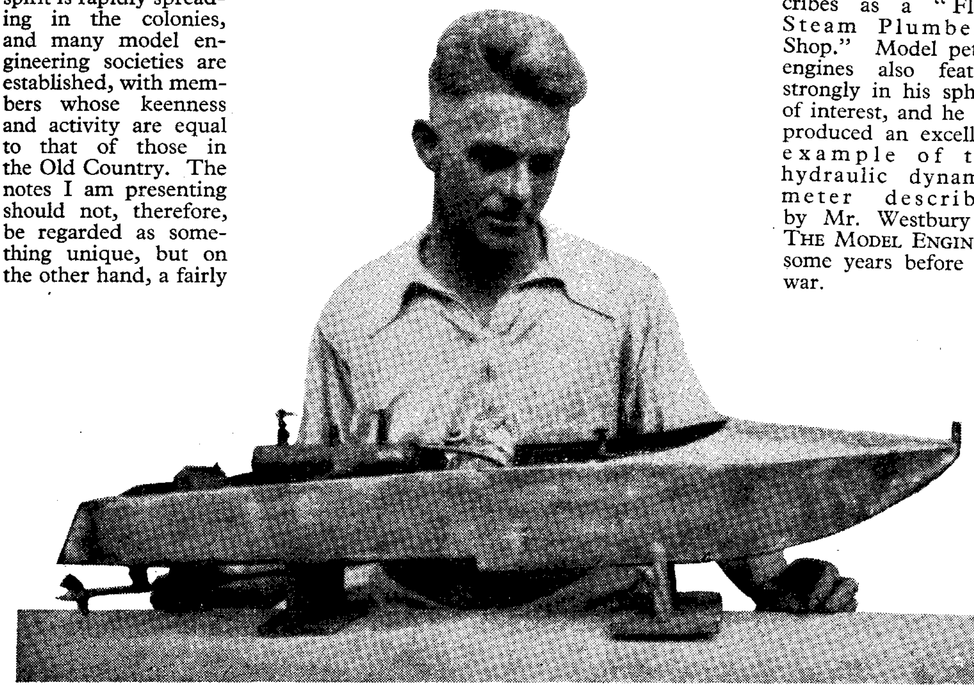
BY " ARTIFICER "

MY wide circle of model engineering friends includes quite a number of readers from the far distant corners of the Empire, some of whom I have never met in the flesh, and, perhaps, am not likely to, but have none the less established a very real and intimate bond of friendship through the medium of correspondence. The occasional news I receive of their activities is always of great interest, and from time to time I have been able to publish details of their work—in many cases carried out under very difficult conditions—which is often of outstanding merit, and rarely lacking in some noteworthy qualities of novelty or originality. There is evidence that the model engineering spirit is rapidly spreading in the colonies, and many model engineering societies are established, with members whose keenness and activity are equal to that of those in the Old Country. The notes I am presenting should not, therefore, be regarded as something unique, but on the other hand, a fairly typical sample of the kind of work which is produced by colonial readers.

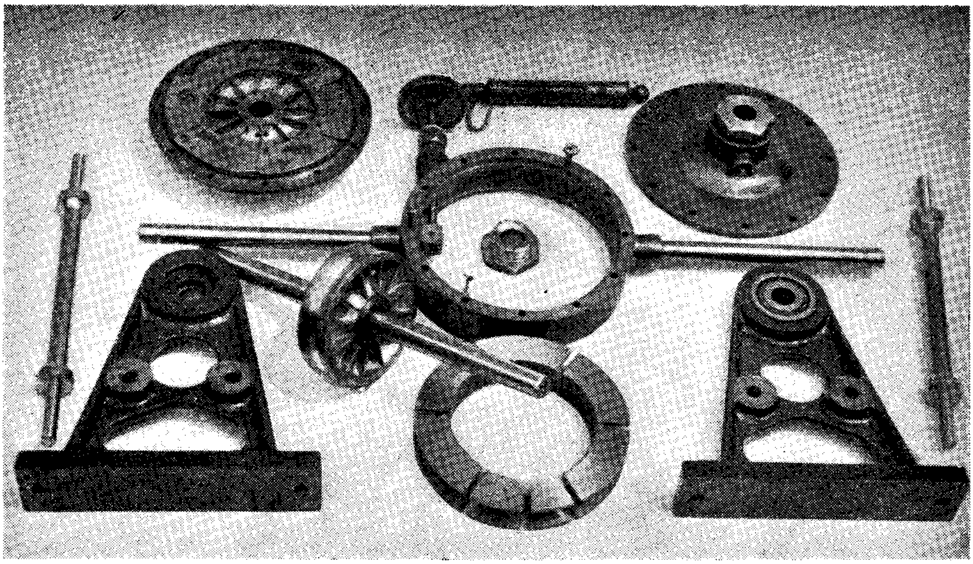


A double handful for Mr. Hansen !

Shortly before the war, I made the acquaintance of Mr. Goode, a keen Australian model enthusiast, who was at that time making a business trip to England, and on a subsequent visit some months ago, he brought with him further news of the activities of model engineers in Australia, including some photographs, a letter and a very interesting model from Mr. Laurence J. Hansen, of Kew, Victoria, N.S.W., who is an enthusiast of very versatile interests, and original ideas. He has produced several successful model power boats, including the one shown in the photograph, which he describes as a " Flash Steam Plumber's Shop." Model petrol engines also feature strongly in his sphere of interest, and he has produced an excellent example of the hydraulic dynamometer described by Mr. Westbury in THE MODEL ENGINEER some years before the war.



Mr. Hansen with his " Flash Steam Plumber's Shop "



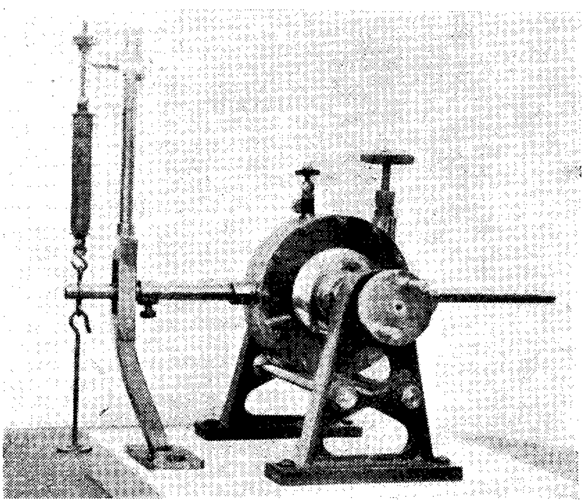
The component parts of the dynamometer, dismantled

A Self-Lubricating Steam Engine

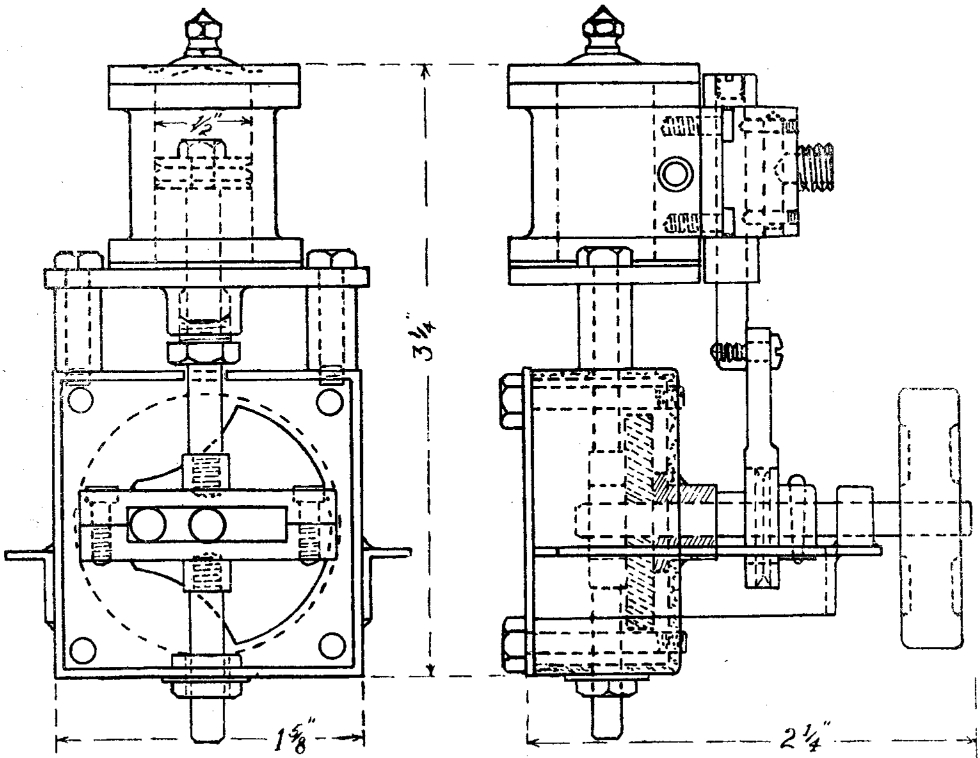
The model steam engine illustrated is of more than ordinary interest, because despite the fact that its general design is on lines familiar to most model engineers, it introduces a feature which goes a long way towards solving one of the most vital problems in the running of small steam engines. This model was brought over and submitted to me by Mr. Goode for examination and test, so I am able to substantiate fully all the claims made for it by the constructor, who states that in the course of some 300 runs of three to five minutes' duration, at speeds from 3,000 to 5,000 r.p.m., the engine has never had (or required) any internal lubrication, and none of the working parts has ever been renewed or re-conditioned.

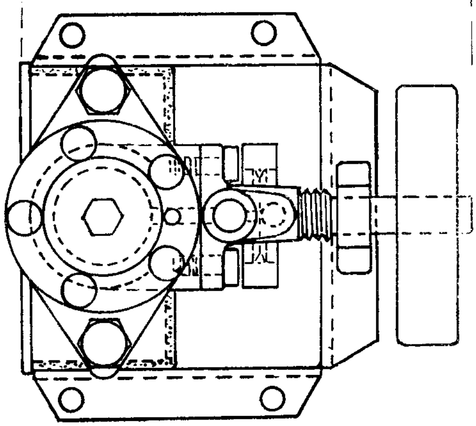
The feature which makes this possible is the use of Micarta (a form of laminated fabric plastic material) for the piston, slide valve, eccentric strap, slide crank guides, and main bearings. This material, which is readily machinable in much the same way as metal embodies the self-lubricating characteristics common to plastics in this class, and is also highly resistant to wear, besides having anti-friction properties. The result is an engine which will stand up to the heaviest work for long periods without turning a hair, and also runs very quietly and freely.

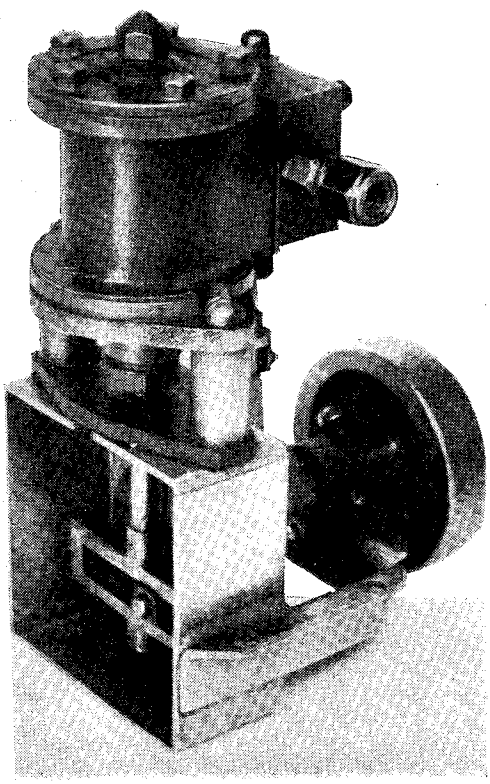
I ran the engine several times on air pressure up to 100 lb. per sq. in., and at this pressure, its speed is extremely high—exactly how high, I was unable to measure with any means available at the time, but certainly comparable with those noisy and malodorous pets of mine, in other words, small petrol engines. Not being a member of the section known by one of my facetious friends as the "Water 'Otters," I did not have a boiler available to test the engine under steam, but have very little doubt that its performance would be equally efficient under those conditions. With saturated steam, the slight condensation should actually improve the anti-friction properties of the material, since water is the recognised lubricant for plastics of this type. It would not, of course, be practicable to use it in engines working on highly superheated steam, owing to the risk



Mr. Hansen's hydraulic dynamometer

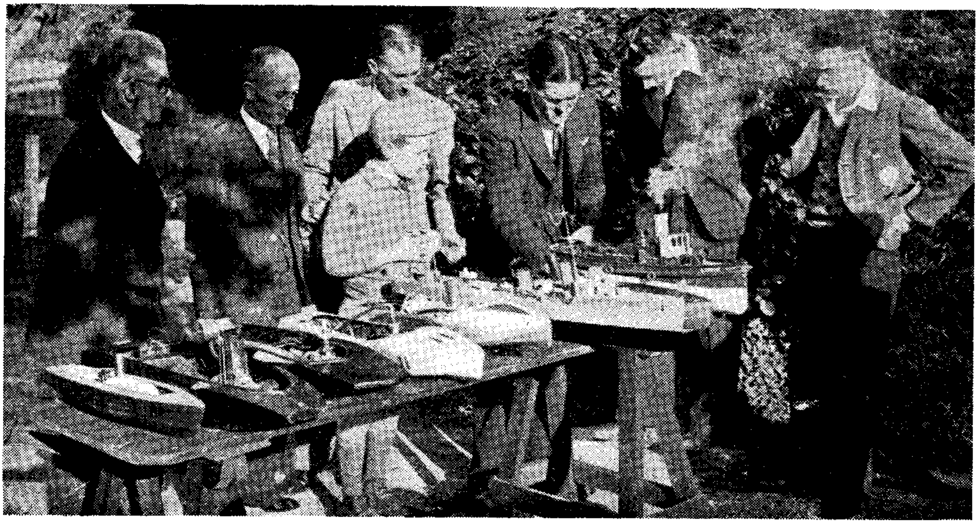






Above—General arrangement of the self-lubricating slide crank steam engine (full size)

Left—Mr. Hansen's self-lubricating model steam engine



A group of members and their boats at a meeting of the Victoria M.P.B.C.

of charring, but the virtues of high superheat, in small engines working at moderate pressures, are not very great; and in practice, few such engines, except those which run on flash steam, encounter high superheat temperatures.

Mr. Hansen states that he is not a lover of engines of the "Scotch" or slide crank type (in which I whole-heartedly support his views) but they have advantages in the reduction of height, and consequent lowering of the centre of gravity, which makes them more suitable for small boats than engines with the orthodox crosshead and connecting-rod.

Scotch crank engines generally tend to be very noisy, and to wear excessively in the crank slides, especially when run at high speed or for heavy duty. This fault is even worse when, as so often happens, the crankpin works directly in the slide, without the interposition of a die block. The slide is often unsupported sideways, so that all side thrust is taken by the piston-rod, and rapid wear of the gland bush ensues as a result. All these faults are very much reduced in Mr. Hansen's engine, which has a tail-end guide below the slide crank to take the side thrust of the slide crank, and wear, noise and friction are mitigated by the use of the Micarta slide block.

It is pointed out that some allowance must be made in machining for the tendency of Micarta to swell when wet. The best way to deal with this is to boil the material in water before machining it. Should slackness result from the subsequent drying out of the material when the engine is not in use, the remedy is obvious; but little trouble seems to be encountered in this respect. It is quite probable that other laminated fabric plastics, such as Tufnol, would prove suitable for making the appropriate engine parts, and the principle need not be confined to small, simple engines of the type described, but could be used, with advantage, on larger and more elaborate steam engines for marine, stationary, or locomotive work.

In view of the difficulty of keeping up adequate and continuous lubrication of small steam engines when run for long periods, and of the harm which is liable to result from neglect of this provision, I regard Mr. Hansen's idea as an important practical contribution to design, which should be worthy of consideration by all model steam engine constructors.

Mr. Hansen's achievements also include the construction of ultra-high-speed cine cameras, direct blood transfusion apparatus, and the production of optical flats to super limits of accuracy, all of which is carried out in a simply-equipped home workshop. His professional duties consist of research and development work for a large Melbourne die-casting works.

The remaining photograph shows a group of members and models at a field day of the Victoria Model Power Boat Club (Australia)—not to be confused with its famous London namesake.

The President of the club, Mr. E. Butts, has produced a very interesting marine steam plant, comprising a briquette-fired horizontal boiler, double-acting engine, $\frac{3}{4}$-in. bore by $\frac{13}{16}$-in. stroke, with separate feed pump engine, $\frac{3}{8}$-in. bore by $\frac{1}{2}$-in. stroke, and 5/32-in. plunger. This normally works on 10 lb. p.s.i. of steam, and 15-in. vacuum in condenser. It will turn a 4-in. three-bladed propeller in water at 200 r.p.m. on 3 lb. p.s.i. of steam.

To Hertford Readers

A note from Mr. J. Waldock asks for readers in the Hertford district who would be interested in forming a local society to get into touch with him. His address is "Omega," Great Molewood, Hertford.

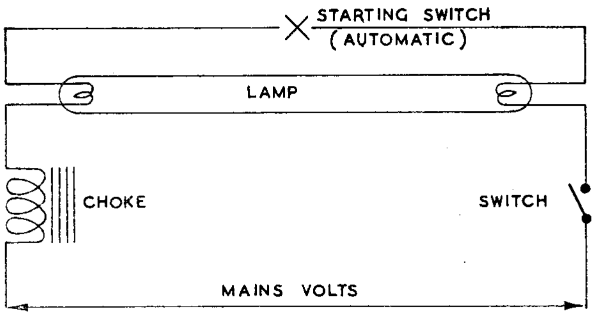
FLUORESCENT LIGHTING

for the Home Workshop

by H.C.W.

FLUORESCENT lighting if installed correctly is, of course, *the* very thing for lighting the home workshop. It gives the nearest approach to daylight and owing to the surface area of the lamp, there are no appreciable shadows on the work bench. It is also three times more economical in the use of electricity than the metal-filament lamp.

The most satisfactory is the tubular type which is corrected by means of a fluorescent powder on the inside of the tube so as to give a white light. Unfortunately, fluorescent lamps are not the simple " plug-in " devices that are the ordinary filament lamps. They are a gaseous discharge and practically all gas discharge devices need some ballast or other connected in series to prevent them taking heavy current from the mains and so being destroyed. This ballast, in the case of the tubular fluorescent lamp, is usually a choke, that is a laminated iron core wound with a number of turns of insulated wire.



This choke limits the current that can be taken from the mains when starting up, as during the first few moments of starting the impedance of the lamp may be very low indeed.

Tubular Lamps

The general arrangement of the tubular lamp is shown in Fig. 1, and it will be seen that there is a filament at each end of the tube. In starting up, these filaments are connected in series and are also in series with the choke across the mains and the tube itself is shorted out. After a few seconds the tube switch is unshorted and the hot filaments start the glow in the tube.

There are several varieties of these lamps on the market and all makers supply chokes and control switches designed to suit their particular products and it is therefore not possible to give design figures for the different types. By far the best way is to buy the whole outfit from the manufacturer and no doubt the more affluent members of the workshop fraternity will adopt this course.

For the others, like myself, who begrudge buying anything that they can possibly make for themselves, the only course is the " cut and try " method. Knowing the wattage, make a choke which when connected directly across the mains will pass not more than the rated current and yet will allow this current to pass without overheating.

Connect this up and keep removing turns, or increasing the airgap in the choke cone, until the point is reached when the lamp, after having been alight several minutes to allow it to settle down, is consuming the correct wattage. It must be borne in mind that consumption in this case will not be just the product of volts × amps., but if no other method is available, one can always use the electric light meter for this measurement.

Measuring Consumption

All electric light meters are marked with a figure of revs. per kWh (kilowatt-hour). Suppose the figure is 600 revs. per kWh. This means that when the disc, that can be seen moving inside and which usually has a paint mark on it, has gone round 600 times, one kilowatt-hour has been consumed. If this takes one hour, then the load is one kilowatt or 1,000 watts. It would become rather tedious perhaps if one had to sit for an hour on a heap of coal in the cellar with a candle in one hand and an alarm-clock in the other and so, of course, we need only time it for one minute during which time it should go round ten times if the load is 1,000 watts. It is a simple matter to find out the number of turns in a minute for say 40 watts, it will, of course be $\frac{10 \times 40}{1,000}$, or 0.4 of a turn. Now this is going to be rather difficult to measure, so we shall have to time it over ten minutes and it should during this time make four turns.

It should be clear, of course, that all other lights in the house are switched off before the test is started and all the family are warned not to switch on during the process, on pain of great displeasure!

The automatic switch, which is not very costly anyway, could be replaced at a pinch by a simple hand-switch.

The smallest fluorescent lamps available in this country are rated at 40 watts, but lower powers than this are available in the U.S.A.

"L.B.S.C."

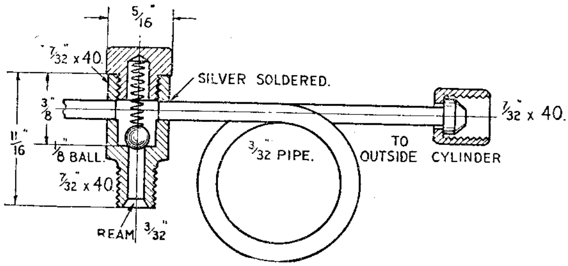
OIL PIPES AND CLACKS FOR "HIELAN' LASSIE"

THE last plumbing job at the leading end of the engine, is the making and fitting of the oil pipes for cylinder lubrication. Two small clacks or check-valves are needed; they are really a kind of extra check on the oil feeds, because a properly-made lubricator will work perfectly with one clack only, or even none at all, provided that the port in the pump cylinder does not bridge the ports in the stand, thus allowing steam to blow right through into the oil tank. However, I usually specify two clacks, same as for water-pumps, and this makes certain of a steady delivery of oil. Sections of the two clacks are given here; and the method of making them, and fitting the ball-valves, is precisely the same as detailed out for the two clacks on the boiler backhead, so we needn't go over the full ritual again. The oil clacks are much smaller, being made from $\frac{5}{16}$-in. bronze or gunmetal rod; the ball chambers are drilled $\frac{3}{16}$ in., and bottomed with a D-bit of that size, the holes through the lower part being drilled No. 44 and reamed 3/32 in., for $\frac{1}{8}$ in. ball-valves.

Beginners please note: a ball-valve in a water pump, or in a clack used for water, with boiler pressure above it, will seat tightly without any aid, as long as the seating is true. Not so in an oil-clack used for the heavy grade of oil needed for correct lubrication of cylinders and valves taking steam at a temperature of 600 degrees or over. The balls kind of "float" in the heavy oil; that isn't to say they would float on the surface if you dropped them into a tin lid or saucer containing the oil. They would sink all right, but so slowly that an oil-pump might make another stroke or two whilst they were thinking about settling on the seatings, so that oil would run back into the pump-barrel, and delivery would be either intermittent, or cease altogether. For that reason, the cap of the clack feeding the outside cylinders is drilled, and furnished with a spring, as described for the upside-down clacks on the lubricator. The "thoroughfare" nipple on top of the clack feeding the inside cylinder, is counterbored for half its length to admit a similar spring; and the top coil of the spring should be opened up to a tight fit in the hole, so that the spring can't slip into the 3/32-in. oil-way through the union section of the nipple.

Connecting-Pipes for Outside Cylinders

After machining the body of the clack for the outside cylinder feeds, poke a No. 43 drill clean through it, $\frac{3}{16}$ in. from the top, and fit a length of 3/32-in. copper tube into each side, silver-soldering it into the clack body. Now note—very important, this—that unless the two oil-pipes leading from the clack to the right- and left-hand cylinders are *exactly the same length*, one cylinder will get more oil than the other. A shorter pipe offers less resistance to the oil, and more will go through it; a fact often overlooked by the good people who put engines on paper instead of on the track. I've seen plenty of glaring examples! After silver-soldering the pipes, put a little loop in one pipe, close to the clack, hold same in the position it will occupy on the engine (a little to the right of the inside guide-bar, opposite the valve-spindle) and cut the pipe to such a length that it will just reach the 7/32-in. union nipple on the left-hand steam-pipe just above the flange on the steam-chest. Then cut the other pipe to exactly the same length, and fit 7/32-in. by 40 union nuts and cones to the end of each pipe. When finally coupling-up, it doesn't matter whether you coil the right-hand pipe twice, or make an oval coil or a loop; any old way will do, so long as it looks neat, but the two pipes *must* be equal in length between the clack and the unions on the cylinder steam-pipes.



Oil clack for outside cylinders

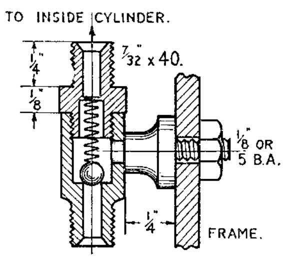
Incidentally, beginners frequently ask why it is necessary to feed the oil into the steam-pipe instead of direct into the steam-chest. The answer is, that the rush of steam picks up the drops of oil and converts them into a spray or mist, which reaches every part and lubricates it much more effectively than if the oil were introduced straight into the steam-chest and left to find its own way about.

The lower end of the clack is connected by a piece of 3/32-in. pipe, with a 7/32-in. by 40 union nut and cone on each end, direct to the outlet clack on the underside of the lubricator, fed from the larger pump. It doesn't matter about the actual length of this pipe, neither does it matter which course the pipe takes between lubricator and clack; underneath the inside cylinder, close to the lubricator drive-rod is as good a route as any. No support is needed for the clack, as it weighs only a fraction of an ounce, and this is easily sustained by the three pipes; neither will vibration affect the spring-loaded ball.

Ditto for Inside Cylinder

After machining the clack-body from a bit of $\frac{5}{16}$-in. rod, to the dimensions given for the clack for the outside cylinders, drill a $\frac{1}{8}$-in. hole in the side, $\frac{3}{16}$ in. from the top, and fit a support in this as shown in the sectional illustration. Chuck the $\frac{5}{16}$-in. rod again in three-jaw, and turn down $\frac{5}{16}$ in. of it to $\frac{1}{8}$ in. diameter, screwing it $\frac{1}{8}$ in. or 5-B.A. Part off at $\frac{5}{8}$ in. from the end. Reverse in chuck, turn the other end to the shape shown, and turn a $\frac{1}{16}$-in. pip on the end to a tight fit in the hole in the clack body. Silver-solder it in. The thoroughfare nipple on top, is made by the same process as described for the one on the hollow stay, except that it has a plain stepped hole as shown, and no internal thread.

After assembling, drill a No. 30 hole in the left-hand frame, $1\frac{1}{4}$ in. from the top, and about mid-way between the lubricator and cylinder. Put the stem of the clack support through this, and secure it with a nut on the outside of the frame as shown. All you then need, are two lengths of 3/32-in. pipe, with a 7/32-in. by 40 union nut and cone on each end of each piece. The lengths are obtained from the actual engine. The lower pipe starts from the clack under the lubricator which is fed by the smaller pump, and is coupled to the underside of the clack attached to the frame. The upper pipe starts from the top nipple on the clack, and proceeds *via* the smokebox saddle, "coming shortly," to the union nipple on the fitting connecting the steam pipe to the inside cylinder, described in the last instalment. Whilst I have specified 3/32 in. pipes, for the sake of neatness, $\frac{1}{8}$ in. can, of course, be used if the smaller size is not obtainable. In case our old friend Inspector Meticulous, or any of his friends and relations, start saying things about friction and resistance in the small-bore pipes, I would point out that the oil only "crawls" through, the pump making one stroke to every 35 revolutions of the driving wheels; also the smaller pipes keep cooler, and in the event of any careless engineman allowing smokebox ash or any other foreign substance to get into the lubricator and jam up the clack balls, there is not much risk of steam blowing back and stopping the oil feed. Remember that the internal diameter of a 3/32-in. pipe is equal to a pipe of 1 in. bore on a full-sized engine, and no locomotive engineer in his right senses would specify oil-pipes of that diameter! On the old L.B. & S.C.R. engines, the average size of the oil-pipes was $\frac{3}{8}$ in. and they passed all the oil the engines required.

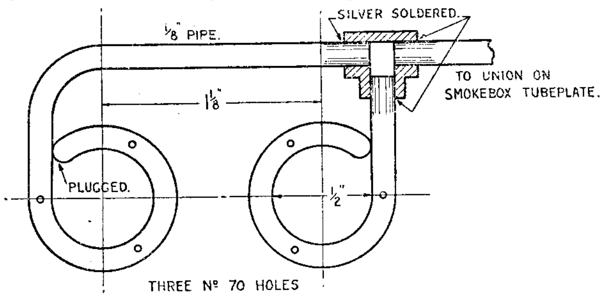


Oil clack for inside cylinder

Blower Rings

Whenever I have anything to do with a double-chimney blower, I always recall, with a chuckle, that famous commercially-made "Cock-o'-the-North" about which such a fuss was made, and which eventually came into my own possession because it wouldn't go! It had a double chimney, and a single-jet blower *up one side only*, so that it sucked air down one side and blew it up the other, instead of drawing it through the firebox. I still have the engine, it has done some good work since I replaced the original boiler with one of my own, re-conditioned and altered the "works," and effected minor improvements; but the said "works" (especially the thin expansion links with bent-over tags to carry the trunnions) are nearly "shot to bits" and she will soon need a thorough rebuild, with cylinders and motion such as I would fit to a $2\frac{1}{2}$-in. gauge "Lassie."

To make the twin ring blower for the $3\frac{1}{2}$-in. gauge "Lassie," bend up two rings of $\frac{1}{8}$-in. copper tube as shown in the accompanying illustration, letting the ends of the rings come flush against the stock tube. Drill three holes equidistant in each ring, with No. 70 drill; be careful not to let the drill splay outwards, but if it inclines inwards a little, towards the centre of the circle, it will not matter much. File up a little tee-piece from a bit of $\frac{1}{4}$-in. by $\frac{3}{8}$-in. brass rod about $\frac{3}{8}$ in. long; drill longitudinal and cross holes through it as shown in the section, using No. 32 drill. Fit the two rings in it as shown, and another piece of $\frac{1}{8}$-in. pipe long enough to reach to the thoroughfare nipple on the hollow-stay, when the two rings are resting on the blast-pipe nozzles. Fit a $\frac{1}{4}$-in. by 40 union nut and cone on the end of this pipe, then silver-solder the whole lot—union cone, tee-piece joints, and the ends of the rings—all at one heat. Pickle, wash off, and clean up, and be sure the whole doings is perfectly clean inside, because it doesn't take a very big obstruction to stop up the No. 70 holes in the rings. The complete assembly can be connected up to the hollow stay union before putting on the superheater "for keeps," the latter job being the last to be done before finally attaching the smokebox and erecting the boiler.



Twin blower rings

"JULIET"

Boiler Assembly, First Stage

Fitting the firebox and tubes into the shell of "Juliet's" boiler is an easier proposition than doing it on the "Lassie," but the *modus operandi* is very much the same; and if you have read the "Lassie" notes, there isn't much to add. However, whereas the "Lassies'" front firebox plate butted up to the throat-plate direct, on "Juliet's" boiler we have to insert the front section of the foundation ring, as the firebox tubeplate butts up against it, and is held to it by three rivets through the lot. Cut a piece of $\frac{1}{4}$-in. square copper rod approximately $2\frac{5}{8}$ in. long, and fit it tightly between the flanges at the bottom of the throat-plate; and beginners especially, don't forget to clean the bit of rod with a file, also the metal it comes in contact with, so that the brazing material will "take," and the ring be free from leakage.

Lay the boiler-shell upside down on the bench, and slide the firebox-and-tube assembly into it, letting the firebox tubeplate butt up against the bit of foundation-ring just put in. Adjust the firebox so that the distance between it and the shell is the same at each side; then put a couple of toolmaker's cramps over the lot—throat-plate, piece of rod, and tubeplate—screwing them tightly so that nothing can shift. Then see if the top flanges of the crown-stays are making full-length contact with the wrapper. If not, make the necessary adjustment until they are; then put a clamp on the end of each, to hold it to the shell. Next, put in a few 3/32-in. round-head copper rivets to hold the parts whilst brazing; three will be enough to hold the firebox, rod, and throat-plate together, and four through each crown-stay flange and the wrapper. Use No. 41 drill. I described how to rivet the crown-stay flanges when describing "Lassie's" boiler; briefly, after drilling the holes and scraping off burrs, insert rivets with a notched strip of metal, and rest the head on a bar sticking sideways out of the vice jaws whilst you assault the stem outside the wrapper with the ball end of the hammer-head. Beginners take care to hit the rivet and not the wrapper; and you needn't be particular about making the heads look pretty, as they can be filed flush after the crown-stays are silver-soldered to the wrapper, their period of usefulness then being over. The silver-soldering provides all the strength needed.

Now insert the smokebox tubeplate, flange first and vertical, so that the tube holes lie in horizontal rows. Carefully drive it in until it is almost touching the tubes, then line these up with their holes, by aid of a piece of round wood; a skewer, pencil, or knitting-needle does well. Drive the tubeplate down a little farther until all the tubes project about 1/32 in. The tube ends are then expanded into the holes by driving a taper drift into each; this is just a tapered piece of metal like a drill shank, perfectly smooth. Grease it before inserting into each tube; give it three or four cracks with a hammer, and the job is done. It should come out quite easily with a pull; if not, hit it gently sideways, or prod it out with a rod through the tube.

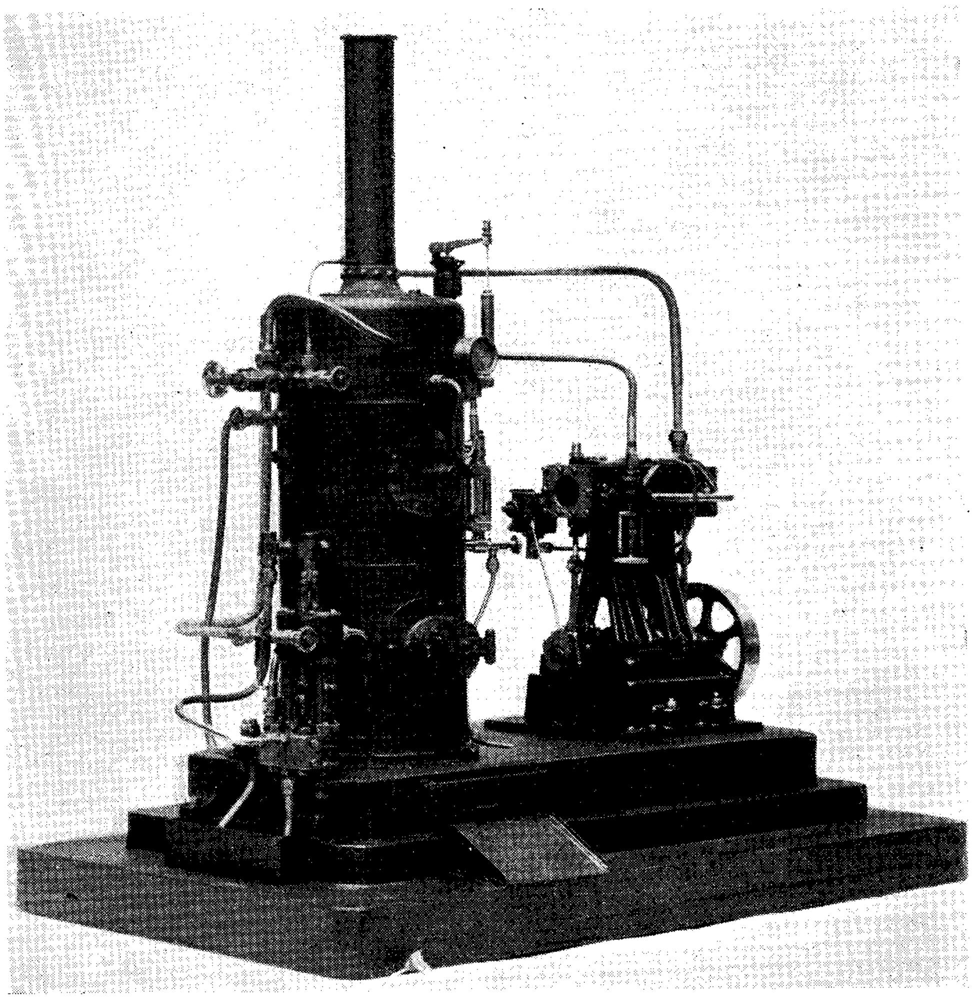
An Easy Brazing Job

The operation of brazing in the smokebox tubeplate, and silver-soldering the tubes and crown-stay flanges, was described in some detail quite recently for the "Lassie's" boiler, and even more fully for "Petrolea"; so I need not elaborate again here. Briefly, put some wet flux around the edge of the smokebox tubeplate, around the tubes, and along the crown-stay flanges. Plug the tube ends with wads of asbestos string or flock. Stand the boiler, barrel upwards, in the brazing-pan, and put a lid or tray with a hole in it, over the barrel, about 3 in. or so down, propping it in position by aid of bricks or anything else handy. Pile coke around to level of end of barrel; heat up the whole boiler end, then concentrate on one point of the circumference, apply the brazing-strip, and work your way right around, as described for the throat-plate joints. Beginners, don't forget that the metal of the barrel and tubeplate must be hot enough to melt the brazing-strip, otherwise you will get a leaky and defective joint. Small pieces of silver-solder can be dropped among the tube ends, and the whole lot done at once by directing a big flame over them; or you can blow on two or three at a time, and apply your silver-solder in a strip. If the tube ends are hot enough, the end of the strip will melt, and the liquid metal will "flash" around each tube, making a neat and perfect seal.

When the smokebox end is done, whip off the tray quickly, so as to prevent the boiler cooling off, and lay the latter on its back in the pan, with the firebox overhanging. By blowing the flame first inside, and then underneath, direct on the wrapper opposite the crown-stay flanges, it is possible to heat up the lot to medium red, at which temperature a strip of good-grade silver-solder will melt and "sweat" completely through the joints between flanges and wrapper. It is a good plan to lay a strip of silver-solder along each side of each crown-stay flange, covering them with flux; and then all you have to do, is to apply the heat treatment inside and out, until the flux fuses, the silver-solder melts, and finally disappears into the joints. If you are lucky enough to possess two blow-lamps, use one (the smaller) to blow inside on the flanges, and the other to blow outside on the wrapper; the job can then be done very quickly. Let it cool to black before putting it in the pickle, and mind the splashes; the boiler will hold a considerable amount of "therms" even when black-hot, as it now has plenty of metal in it.

Back-head and Foundation Ring

Cut out a piece of $\frac{1}{8}$-in. sheet copper about $\frac{5}{16}$ in. larger than the back-head former, all around except at bottom, and flange it over the former as previously described, cleaning the flanges with a file. Measure distance from top and sides of wrapper, to firehole ring; transfer measurements to the back-head, and mark the outline of the fire-hole ring in the position indicated. Cut out the piece, either by drilling holes all around inside line, breaking the piece out, and filing to shape, or "fret-sawing" it out with a metal-piercing saw. Place back-head in position, with the lip of fire-hole ring sticking



Locomotive blobs and gadgets on Mr. P. J. James's stationary engine

through the hole, and beat down the lip over the back-head, outwards, so that the plate is gripped tightly between the beaten-down lip and the shoulder. The ring can be supported by a bar of iron projecting sideways from the vice-jaws, while the operation is in progress. If the wrapper isn't in close contact with the back-head flange all around, teach it manners with a mallet or soft hammer. I use a hide-faced hammer for jobs like these.

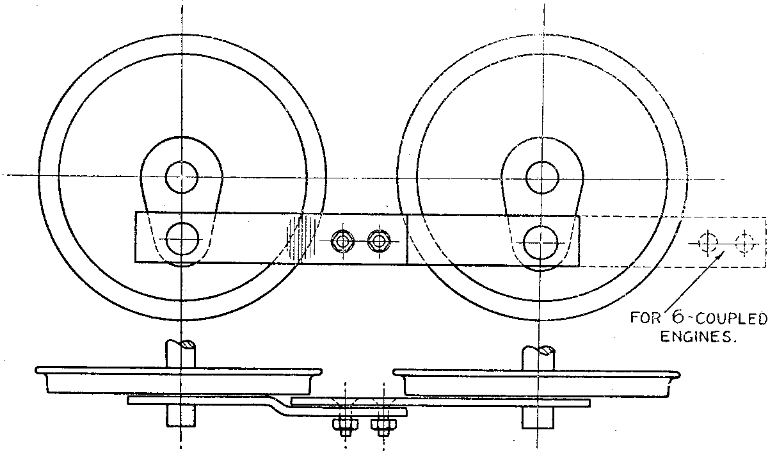
The spaces at the sides and rear end of firebox, between it and the wrapper and back-head, are now filled up with pieces of $\frac{1}{4}$-in. copper rod, cleaned with a file, and inserted so that the edge of the wrapper is about $\frac{1}{16}$ in. proud of them, this leaves something against which the brazing material can run and form a fillet. Hold them in position with a tool-maker's cramp at each end, and drill No. 41 holes at about $\frac{5}{8}$ in. centres through the lot, securing with 3/32-in. copper rivets as mentioned for the front section between firebox and throat-plate. If there should be interstices at the ends, where the four sections of the ring meet, plug them with splinters of copper, driven in flush. If you haven't already drilled the holes on top of the barrel for the dome and safety-valve bushes, do it now (I usually do this job when first making the boiler-shell) then turn up the bushes as shown on the longitudinal section, and fit them. They should be a good tight fit in the holes. Warning to beginners: never make bushes of brass, always use good gunmetal or bronze, either drawn or cast. Personally, I prefer copper, and always use copper bushes when material suitable for making them is available. The dome bushes for "Jeanie Deans" and "Grosvenor" were turned out of pieces sawn from a copper plate $\frac{3}{8}$ in. thick, the square being held in the four-jaw whilst the hole

(Continued on next page)

PRECISION WORK ON COUPLING-RODS

by T. RICHWOOD

THE following method was employed to locate my coupling-rod centres accurately and easily and will ensure that any other "first timer" in the small locomotive world may do likewise. The engine is an 0-4-0 industrial tank, 5 in. gauge and was started when Mr. Cox suggested it *via* "L.B.S.C." in THE MODEL ENGINEER. The wheel centres are 7 in. so, of course, the coupling-rod centres must be the same. When the wheel centres were checked with a height vernier they were found to be 6.994 in. and 6.995 in. so 0.006 had been lost in marking out the frames etc. The problem was now, how to drill the rods. Although the centres could be marked accurately enough using the vernier, a lot can happen between "popping" the intersection of two lines and drilling a hole. There was a good method described two or three years ago in THE MODEL ENGINEER using a dial indicator and toolmaker's buttons but these were not available, and in any case this method is quicker. The crankpins are $\frac{7}{16}$ in. diameter and although it is known that a running clearance is necessary to allow the wheels to "ride" to the road, the clearance is lost if it is used to correct inaccuracies in the centres. Two pieces of steel 1 in. $\times$ $\frac{1}{8}$ in. $\times$ 6 in. were cut and a $\frac{1}{8}$ in. joggle made in one at about $1\frac{1}{2}$ in. from one end so that when one piece is laid on the other as in the sketch the ends are in the same plane. At about $1\frac{1}{2}$ in. from the end of each piece a $\frac{7}{16}$ in. hole was drilled and reamed. The chassis was stood on temporary rails with each crankpin on the centre and the pieces of steel fitted on to each pin. The pieces of steel were lined up, cramped together and drilled with two $\frac{3}{16}$ in. holes at about $\frac{3}{4}$ in. centres. The pieces were taken off and the outer piece of steel opened out to $\frac{1}{4}$ in. diameter and the inner piece countersunk on the inner side. Two $\frac{3}{16}$ in. diameter countersunk bolts and nuts were used to fasten the pieces together. They were only "nipped" up and not tightened. The jig was placed on the crankpins again and the chassis rolled up and down the piece of track until, by adjusting the jig centres, no hard spots were felt. Then the nuts were tightened up and the jig removed. Two drill bushes were made of silver steel $\frac{7}{16}$ in. outside diameter and $\frac{1}{4}$ in. bore. They were not hardened as they were not required to drill more than two holes each. With the drill bushes in position and the jig clamped to the rod the holes were drilled $\frac{1}{4}$ in. diameter. The jig was removed and the holes opened out in easy stages to $\frac{7}{16}$ in. and the rod tried on the chassis. The final size was $\frac{9}{16}$ in. to accommodate the gunmetal bushes but to check the method the rod was tried whilst there was still time to correct if things had gone wrong. The jig worked perfectly, however.



"L.B.S.C."

(*Continued from previous page*)

was drilled; then the piece was chucked by the hole, and the outside turned to shape. When the bushes are fitted to the barrel—none are needed in the back-head—the boiler is then ready for the final brazing job.

Another Use for Blobs and Gadgets

'Tisn't only locomotive builders who find these notes useful! The engine shown in the reproduced photograph is the handiwork of Mr. P. J. James, of Worcester, who incorporated in it all the principles expounded in the "gospel of live steam," and added some locomotive fitments which can be clearly seen in the picture, namely, duplex donkey-pump of the type with central trip-rods, injector, and mechanical lubricator. Our worthy friend says they all give complete satisfaction, and do not look out of place, adding to the efficiency of the engine, which is a good worker.

THE "IDEAL LATHE" COMPETITION

ENTRY No. 1. by K. N. HARRIS

THE general dimensions and description are :—

Height of Crs. $3\frac{1}{2}$ in.

Between Crs. 20 in.

Swing in Gap 10 in. × 2 in. wide in front of faceplate.

Swing over bed 7 in. dia.

Swing over Boring Table $4\frac{1}{4}$ in. dia.

Mandrel and Tailstock bored $\frac{9}{16}$ in. × No. 2 M.T.

Mandrel Main bearing $1\frac{1}{4}$ in. dia. 2 in. long.

Mandrel Nose $1\frac{1}{8}$ in. × 12 T.P.I. with $1\frac{1}{4}$ in. plain spigot, to centre faceplate, chucks, etc.

Back Gear $6\frac{1}{2}$-to-1 (approx.) with steel pinions and C.I. Gears.

Cone Pinion	26 T	16	D.P.	$\frac{7}{8}$ in.	Face.
1st Gear	64 T	16	,,	$\frac{7}{8}$ in.	,,
2nd Pinion	26 T	16	,,	1 in.	,,
2nd Gear	64 T	16	,,	1 in.	,,

Drive is by 4-step Vee-cone for "Whittle" link belt. Back gear is of simple type positively operated, "in" or "out" by single lever, giving instantaneous change.

Rear bearing of mandrel is a Hoffman Duplex Radial and Thrust bearing. Front bearing P.B. parallel bush, split 3 ways and nutted both ends, fitted in taper housing in main headstock casting, simply adjustable, with no possibility of misalignment.

A bridge-piece ties the two limbs of the headstock together, adding considerable stiffness to the job.

Bed 36 in. long, 5 in. wide over shears cantilever form, stayed box section, single foot. Arranged to give narrow guide to saddle and separate guide to tailstock (see enlarged section).

Saddle. Has long narrow guide on front shear which does not interfere with tailstock; back shear merely serves to prevent saddle from tilting.

Plain apron carrying solid leadscrew-nuts in two sections to take up backlash.

Boring table 5 in × 9 in. having sufficient travel to face at one setting largest work which can be mounted in gap.

Top slide has 4 in. travel and can be swivelled through 360 deg.; circular indexed base, locked by eccentric shaft.

Feedscrews. $\frac{3}{8}$ in. "Acme" form, 10 T.P.I. left hand. Handles do *not* travel with the slides. Simple friction indices reading in 1/1000 in. to both feeds. Handles double balanced type.

Toolpost of special design with positive height adjustment, see details.

Leadscrew $\frac{3}{4}$ in. dia., 8 T.P.I., "Acme" form carried in bracket at R.H. end of lathe, having floating bronze thrust washers each side squared end for loose handle.

Tailstock. Standard hollow barrel type, either lever or screw operated, the former is shown and strongly recommended.

Parallel side adjustment, locking by rear lever.

It is intended that the lathe should be marketed in its simplest form as described above, i.e. as a back-geared lathe with fully compound rest and traversing saddle.

Provision would be made in machining the bed and headstock to convert it into a full screw-cutting lathe, with auto knock-out in either direction, tumbler reverse etc. Provision is also made for a quick traverse by means of a geared-up (3-to-1) hand drive to the leadscrew at the R.H. end; the pinion of this drive would include a circular graduated disc reading in thousandths of an inch.

The leadscrew nuts are solid and of exceptional length and as they are adjustable for backlash with reasonable lubrication and care to avoid dirt should give long and trouble-free life.

The drawings show the layout for the screw-cutting tumbler reverse train and change-gear quadrant, also the quick traverse device and lead screw clutch, which being double-acting gives a knock-out for either right or left hand threads or traverse.

All slides are fitted with proper adjusting-strips.

Standard Equipment

2 No. 2 Morse Taper Centres.

1 Driver plate slotted type for bent drivers, but adaptable for straight drivers.

1 $9\frac{3}{4}$ in. dia. faceplate.

2 Chuck backplates, fitted to mandrel nose, but only rough-turned on edge and face.

Set of spanners and grub-screw keys.

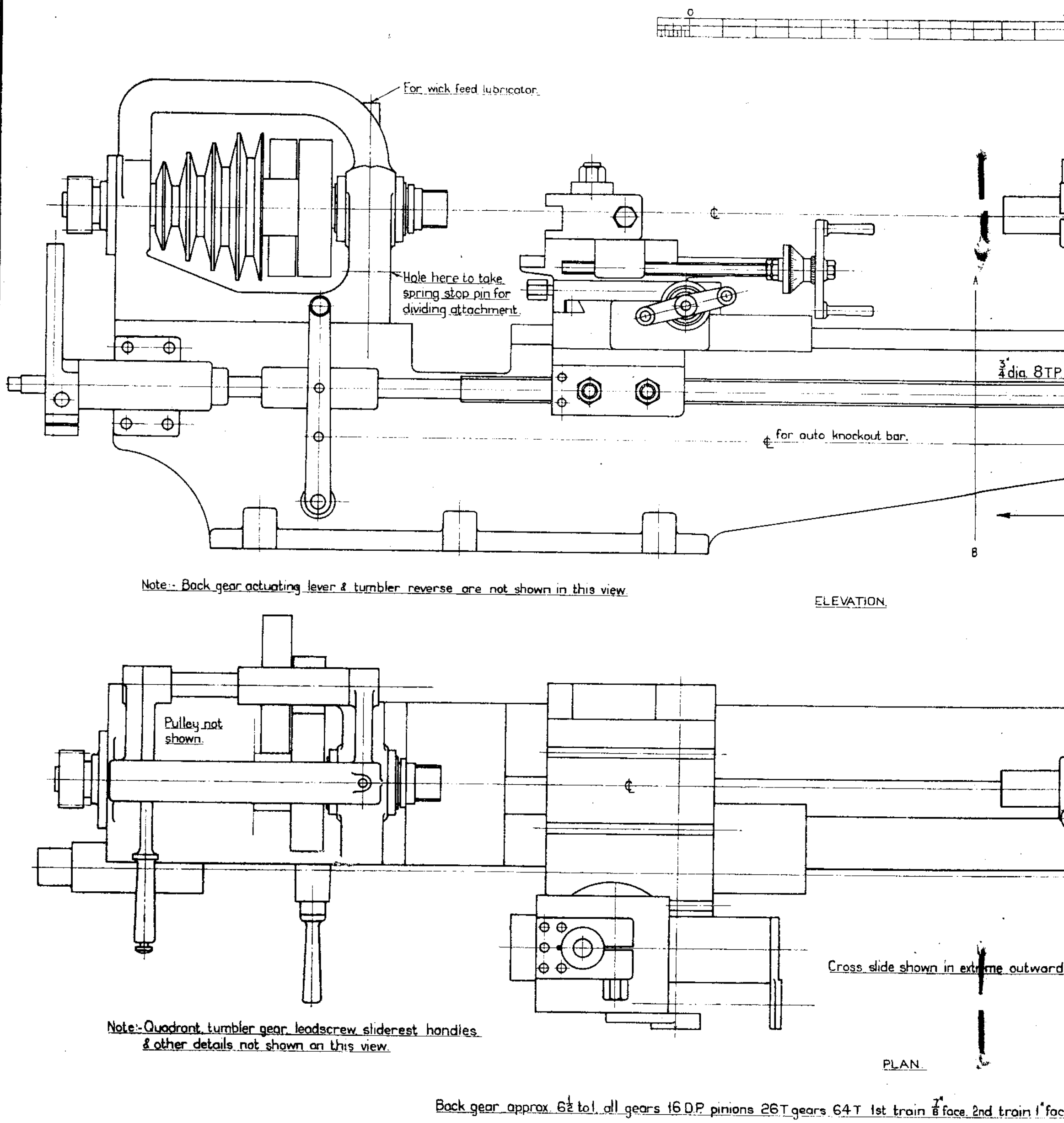
Suitable length of $\frac{1}{2}$ in. "Whittle" belt.

Loose handle for leadscrew.

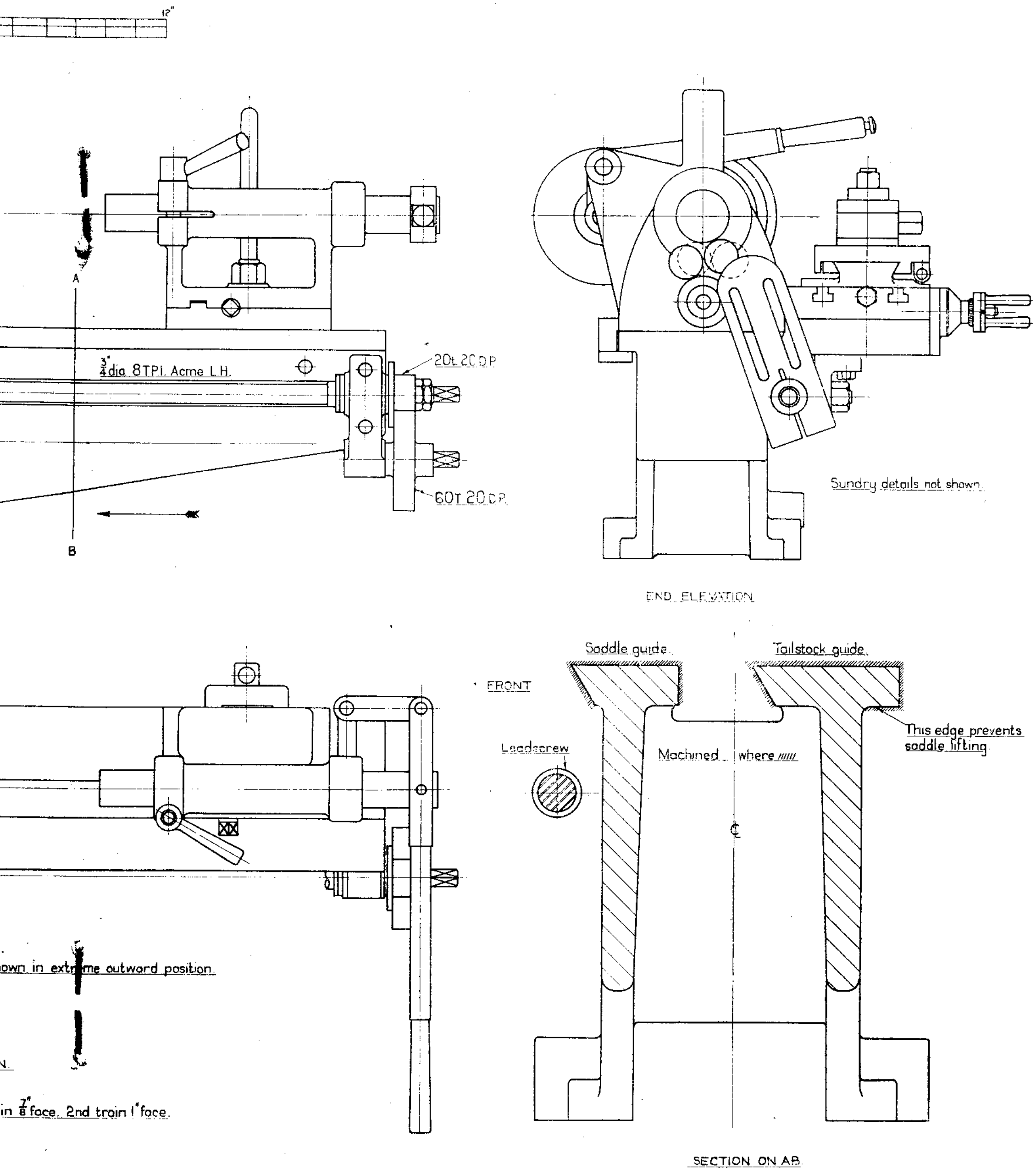
Accessories

The recommended standard accessories are as follows, their order of importance being judged, of course, by the individual requirements of the user.

(1) Collet Adaptor and Drawbar for 8-mm. ("A" Size) collets. There is a range by 1/10 mm. from 0.4 mm. to 7.2 mm. available in this size of collet.
(2) Vertical swivelling slide.
(3) Simple dividing device. This consists of dividing the front face of the large mandrel gear into 120 and fitting a small spring stop to the headstock.



DESIGN BY MR. K. N. HARRIS FOR A 3



HARRIS FOR A 3½ in. CENTRE LATHE

(4) Milling and Drilling spindle for boring table or vertical slide, arranged with standard packing piece, so that when mounted on Boring Table, spindle centre is at lathe centre height.
The spindle would have a direct and a gear drive, either of which could be used according to the requirements of the job in hand.
The spindle would be hollow and adapted to take 8-mm. collets.
(5) Overhead gear, preferably self-contained and driven by separate motor.
(6) Slotting and keyway-cutting device to fit into barrel of lever-feed tailstock.
(7) Eccentric chuck and boring head.
(8) Interpolating dividing stop to replace plain spring stop, to enable divisions other than factors of 120 to be obtained, e.g. 25.
(9) Heavy collet adaptor to mount on mandrel nose, with collets to take up to ½ in. which will pass clear through mandrel.

General Claims

The design follows sound established machine-tool practice so far as all its main features are concerned.

Pains have been taken to ensure great rigidity of bed and headstock together with a robust mandrel mounted in a type of bearing which will give a lifetime of service.

The only "unorthodox" item is the back-gear operation system. Basically, the principle was introduced by Lineker and Winfield of Nottingham many years ago, but in its original form, it was at the tail end of the mandrel and in addition to the lever, required the back shaft carriage to be adjusted and locked for each change.

The gear has been tried out in the Form shown and found perfectly satisfactory and very quick and handy in operation. The very slight endways movement of the cone pulley causes no trouble at all with the belt.

The principle of producing a simple, but thoroughly sound machine in the first place, to which standardised additions can be added as desired, has been adhered to. All additions can be made by the use of spanner, screwdriver, etc. only.

Guards are not shown on the drawings, but would of course be provided for back-gear, change-gears and quick hand traverse gear.

Gear train of change-gears is so arranged that a 127-tooth wheel can be accommodated for metric threads. Change gears are 18 D.P. and a *full* set would consist of 20-21-22-23-24-25-30-35-40-40 and by 5's to 125, and a 127 for metric. Drive through tumbler reverse is 1-to-1.

The use of Whittle belting enables a 4-speed cone to be got in comfortably, thus giving a range of 8 speeds for an individual drive, or 16 speeds for a two-speed drive. The recommended countershaft speed, with cone equal to mandrel cone, is 400 r.p.m. This gives lowest back gear speed 35 r.p.m.; lowest direct gear speed 225 r.p.m.; highest back gear speed 98 r.p.m.; and highest direct gear speed 710 r.p.m. The "Whittle" belt drives with a minimum of tension, is easily adjustable and can be adjusted without disturbing anything. It is completely silent in action.

Provision is made on the headstock for direct mounting of an overhead countershaft which would be cam operated for belt tension and de-clutching.

Notes on Materials

All castings to be in best quality cast-iron, free from blow holes, preferably to be cast in "Meehanite." Mandrel to be of "K.E. 805" or other high-grade steel, preferably heat-treated.

Feed screws and lead screw to be in good quality carbon-steel. Mandrel main bearing in hard gunmetal or phosphor bronze. Tail bearing to be a Hoffman Duplex Medium series, radial and thrust bearing No. M.9 C.D. or equivalent. Nuts for feed screws and lead screw to be in hard gunmetal or phosphor bronze.

Lubrication

A wick feed lubricator to be fitted to the mandrel main bearing. Spring "ball" closed oil holes where required.

Felt wiper pads are desirable for all slides particularly for the saddle and tailstock, but are not essential to the design.

It is important to be sure that the main bearing bush and its adjusting ring nuts have a fine *square* thread and not a "Vee" or "Acme" form of thread; otherwise, when tightening, the vertical pressure component will tend to close the bush and cause binding. This is a small but most essential point.

Explanation of Back Gear

The cone pulley is mounted solid on its pinion which is G.M. bushed, the pinion is wider by some ¼ in. than its gear.

The main gear is keyed to the mandrel and in the face adjacent to the cone pulley a recess 3/16 in. deep is machined into which is fitted a fixed and internally toothed steel ring 3/16 in. thick with teeth to match the cone pulley pinion, set round this in 3 recesses in the main gear, and bearing on the cone pulley pinion are 3 spiral compression springs.

When the cone pulley is free to move in a rearward direction these springs force the pinion out of engagement with the toothed ring, thus leaving it free on the shaft. The back flange of the cone pulley has a chamfered face and a special lever, operating a slipper, when depressed forces the cone and pinion forward and into engagement with the gear ring, thus locking it and providing a solid drive.

The lever also swings in or out the backshaft and its gears, "in" when the slipper is up thus engaging back gear and "out" when the lever is depressed to engage direct gear.

A locking catch is provided for the two positions of the lever.

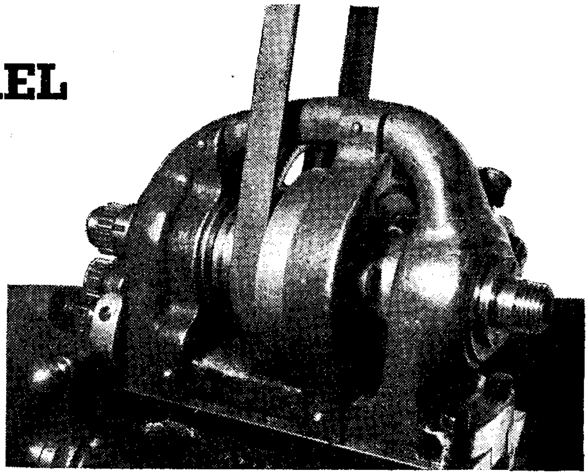
The endways movement of from 5/32 in. to 3/16 in. is ample to provide a solid lock, but insufficient to cause any trouble through misalignment of belt.

The base of the headstock has a planed tongue which fits in the slot of the lathe bed thus ensuring permanent correct alignment. It is fastened down from below by studs and nuts.

A MILNES LATHE MANDREL

An Appreciation of a Successful Design

by "J. L."



THE pre-war Milnes lathes are now out of production, which is a great pity, as all the types which the firm placed on the market were outstanding examples of sound British workmanship at a moderate price.

As the possessor of one of their Type R's of $3\frac{3}{4}$-in. centres, bought in the early 'twenties, I believe that this was one of the best examples of a small amateur's lathe ever produced. It was originally designed with a roller-bearing headstock, which was not an unqualified success, as parallel rollers were used instead of the now generally-accepted Timken taper-roller pattern, which are pre-loaded in order to remove all shake. This early spindle, in consequence, although very free-running, was unsatisfactory for fine work.

As a result, very shortly after it was first introduced in 1922, the lathe was offered with plain bearings as an alternative; and it is with the design of this plain-bearing spindle that these notes are concerned. I have not seen previously a description of this design, and I feel that it deserves to go on record as a most successful compromise between the conflicting factors of sound engineering and cost in a small lathe headstock.

Although I cannot be certain on the point, I suspect that the firm had quite a number of roller-bearing headstocks in hand before they discovered that the majority of their customers preferred plain bearings, and it was therefore necessary to get out a new design, utilising the existing spindle and headstock casting, which had been designed for the rollers.

There was a difficulty here, because the headstock casting at the front was bored out $2\frac{3}{8}$ in. diameter parallel to take the roller-race and the neck of the spindle was likewise $1\frac{1}{4}$ in. diameter parallel, so that there was some difficulty in accommodating the usual type of externally-coned bush, flexibly split, and adjustable lengthways.

How the difficulty was overcome is shown in Fig. 1, herewith, and as far as I am aware, the use of a sliding cone at the front end of a lathe spindle, screw adjusted in this manner is a novelty. At first sight, this form of construction would seem to have several defects, but on looking into the matter more closely, it appears to me to have several important advantages, and the design as a whole would be worth copying on some present-day machines.

Admittedly, at the present time the tendency is to fit a good mandrel with Timken bearings both at front and rear, but if price is a consideration (and to most model engineers it is a factor which cannot be ignored), then a simple plain-bearing spindle is almost certainly cheaper. The modern taper roller-race is a wonderful thing at the price, but the article which is produced in quantities for motor-car work is not sufficiently accurate for fine work on a small lathe, and when these bearings are used for machine-tool spindles, they are made to finer limits than usual, which

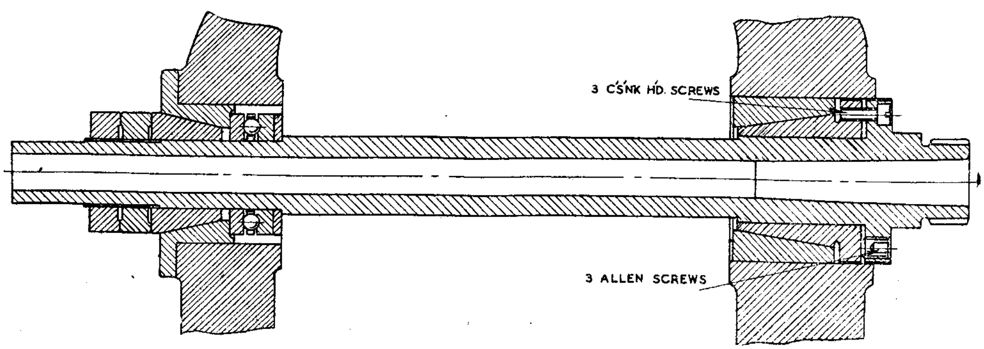


Fig. 1. Section of Milnes Type R spindle

naturally means a correspondingly increased price.

To return to the Milnes spindle; the disadvantage of a sliding cone for adjustment at the front end is that it cannot be quite so rigid as a solid spindle of equivalent size; also the method of adjustment by set-screws may tend to distort either the flange of the mandrel, or cause a slight tilting of the cone. Actually, I think that by careful design and good workmanship these disadvantages can be reduced to negligible proportions, and the advantages of the design are many.

To begin with, the front and rear bearings of the spindle can be hardened and ground without having to harden the whole mandrel. There is no doubt that for a small lathe, a hardened steel spindle, running in hardened steel bushes, gives the best results, and this form of construction is invariably followed in small lathes of the highest class such as Lorch and Boley. However, if price is considered, a completely hardened mandrel is quite out of court, and it will be found that most lathes of modest price have a soft steel mandrel running in either cast-iron or gunmetal bushes. While this form gives reasonable satisfaction, it does not give the results over a number of years that a hardened spindle does.

However, with the Milnes design which we are considering, we get the advantage of the hardened and ground bearings, without the expense that is incurred by having to harden the whole spindle, and this would appear to be a most satisfactory compromise between the very cheapest and the most expensive.

Another important point is that the ball-thrust washer seats on turned shoulders on both faces, which is always desirable in order to avoid any chance of cam action; a defect which is always possible if the thrust bears on adjustable screwed collars.

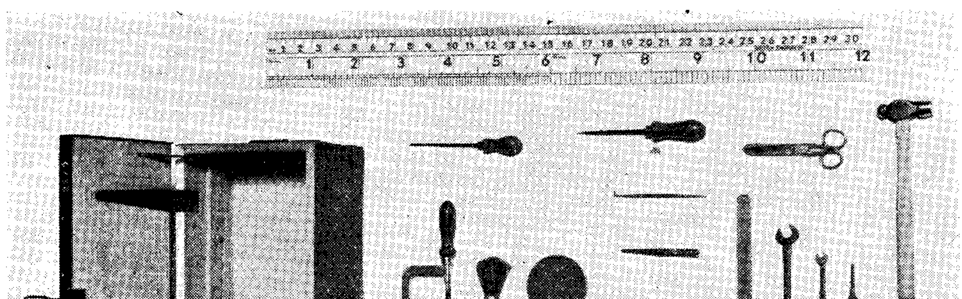
In actual use, I have found the headstock of my own machine remarkably free from wear, and in fact, it has hardly been found necessary to adjust it during all the years that it has been in use; and as I am somewhat fussy as regards the close running of the mandrel, certainly I would have been unable to keep my fingers away from the adjustments if I had had the least suspicion that matters could be improved.

As regards the general rigidity of the headstock, I also have no complaint to make; its general appearance is more in keeping with a lathe of 5-in. centres than a $3\frac{3}{4}$-in., and its performance bears this out. The heavy overarm connecting the two bearings must add considerably to the stiffness, although it limits the possible positions of the countershaft as the belt fouls it at certain angles.

Later models of this lathe dispensed with the overarm, and the scantlings generally of the headstock casting were reduced. No doubt the massive proportions of the earlier headstock were somewhat out of proportion to the rest of the lathe, but most people will agree that this was a good fault, and personally, I prefer my own lathe to later models, and not for this feature alone.

When one considers the excellence of design and workmanship of the lathe as a whole, it was remarkable that it could be sold in bench form for £26, even allowing for the very different value of money in the 'twenties.

MINIATURE TOOLS



The above picture shows an unfinished model of an R.A.F. tool-kit (Fitter 1 and 2) to a scale of 3-in. to 1 ft., made by W. H. Bodfish, while serving on an R.A.F. depot ship in the Mediterranean during the war. This model (a first attempt) was made from scrap material; it went ashore at Alexandria, and survived the North African campaign as far as Italy. About 20 tools are still to be made

ROSE BITS

INSTEAD OF REAMERS

by R. ANGUS

I HAVE been browsing over some back numbers, and I have been impressed with the number of occasions on which the model maker is instructed to use a reamer for finishing a particular part; in fact, treatment of this nature is almost always a necessity in the case of cylinders, piston valves and liners, pump barrels, etc., in order to ensure absolute parallelism of the bore and smoothness of surface.

Leaving aside those instances where internal grinding is employed, in the normal course where accuracy of size and degree of finish and parallelism is of paramount importance, it is the practice either to bore or drill the work slightly under size and finish with a reamer. In the making of model cylinders, there is frequently an element of chance about obtaining a reasonably parallel finish by boring, unless the lathe is in good condition, and where the bore of the cylinder is of any size—e.g., $\frac{3}{4}$ in.—and reaming has to be resorted to, the cost of a suitable reamer is not an inconsiderable item. However, it does not follow that the absence of a reamer is an obstacle to getting a good and true finish to a job of this nature, and it has occurred to me that some, at least, of your readers may find something novel in the fact that it is possible to make a cheap but quite efficient substitute for a reamer, viz. :—a rose bit—suitable for use on brass, gunmetal or cast-iron, for the small cost of the carbon steel required.

Let us assume that it is desired to finish the bore of a gunmetal cylinder, 2 in. long by $\frac{13}{16}$ in. internal diameter. For ease of manipulation the rose bit should be about 4 in. long. Obtain a piece of ordinary carbon steel of this length and $\frac{7}{8}$ in. diameter, mount it between centres and turn down $2\frac{1}{2}$ in. to $\frac{13}{16}$ in. diameter, making the final cuts with a spring tool and applying plenty of cutting lubricant in order to obtain as smooth a finish as possible. Face the end adjacent to back centre and put on a slight chamfer, say, 1/64 in., the function of which is to provide "lead" to aid in entering the hole cleanly when in use. Leaving $\frac{1}{4}$ in. of this end of the piece the full $\frac{13}{16}$ in. to form the head of the bit, reduce the diameter of the remainder of the turned part by .004 in.; this relief gives the body of the bit a clearance of .002 in. in the finished bore and greatly reduces the risk of seizing whilst the head, in addition to sizing the hole, serves to guide the bit during the process of boring. Next, remove the piece from the lathe, and, with the aid of a Swiss or similar file, cut a series of small teeth in the chamfered edge with a set to cut with clockwise rotation; their size, although not critical, should be reasonably uniform and in a tool of this diameter they should number something like forty. Replace the tool in the lathe and run it backwards, meanwhile giving the head a final polish with "blue-black" held flat on a file to remove any traces of burrs made during filing, otherwise these will cause the bit to cut oversize; running in reverse avoids taking the edge off the teeth. This done, harden and temper to dark straw and the tool is finished.

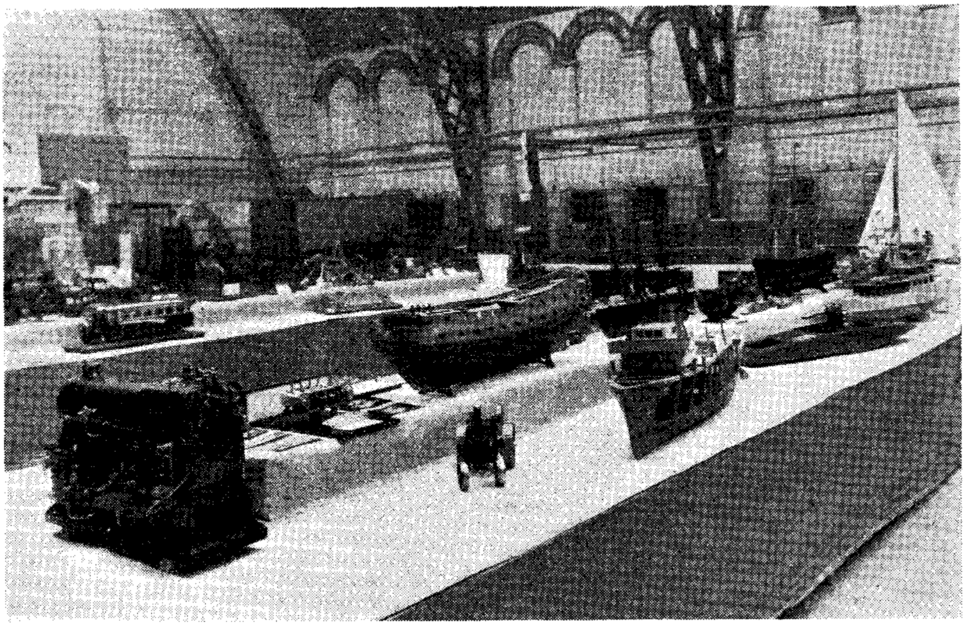
Now for the method of using the rose bit. First, it will not be out of place to observe that a rose bit, like a reamer, is very definitely not a tool intended for the removal of a lot of metal, and to ensure a good finish to a bore, the minimum should be left for the final operation. The casting having been set up in the usual manner, should be bored to within .01 in. of the finished size and the boring tool removed. Then, with plenty of lubricating oil—*not cutting oil*—a medium oil will be found to be the most satisfactory, run the lathe very slowly, at the same time feeding the bit into the hole slowly and steadily by means of the back centre, which serves to guide the bit truly, until the head emerges at the other end. Apply more oil to wash off the swarf, and, with the lathe still running slowly, withdraw the bit carefully until it is quite clear of the work. The bit is prevented from rotating by means of a lathe carrier fixed on the tail end.

Note.—Throughout the whole of the operation, both boring and withdrawal, the bit must be held firmly in contact with the back centre, any inclination to drag on being suppressed and more oil added. A smooth finish will then result, the parallelism of which may be verified by using the bit as a plug gauge.

The golden rules are: (a) leave very little metal for final removal; (b) copious lubrication; (no oil, of course, for cast iron), and (c) be judicious with the revs. and the feed.

Smaller bits for finishing pump barrels and similar articles may be made in the same manner from silver-steel, and will be found to eliminate a considerable amount of tedious work in trying to get small parallel holes by boring. It is also possible to make these bits of any odd size for obtaining a running or force fit where a suitable drill is not available, but these, like the larger types, should be used either in the lathe or drilling machine, in order to maintain correct alignment and accuracy. The results that can be achieved with these bits will surprise those who have not previously tried them.

In conclusion, although the rose bit has earlier been referred to as a substitute for a reamer, it should be understood that this is intended to apply only to the limited extent indicated; obviously, the reamer has a considerably greater scope. Rather is the rose bit a stand-by which is capable, in suitable conditions, of producing results which, viewed from the practical standpoint, are of comparable accuracy, and which has the additional merit of being readily made for a job where the cost of a reamer would be disproportionate.



A view of the hall, taken before all the models had arrived

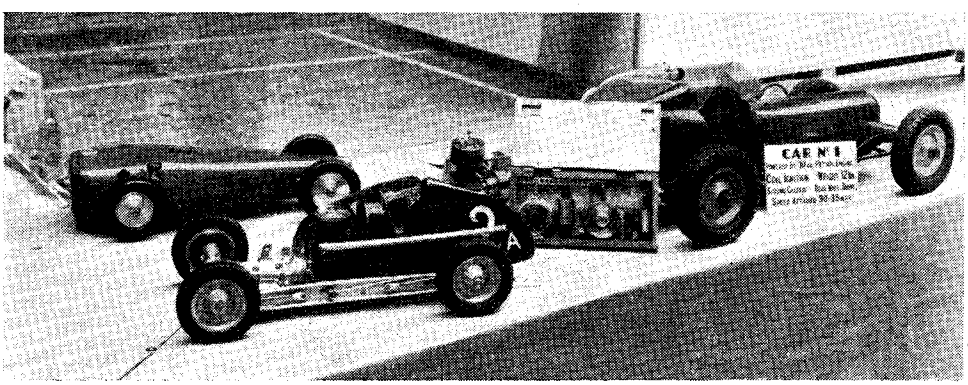
Congratulations to The Nottingham S.M.E.E.

THE Nottingham Society of Model and Experimental Engineers are to be congratulated upon the splendid exhibition recently held at the Victoria Baths.

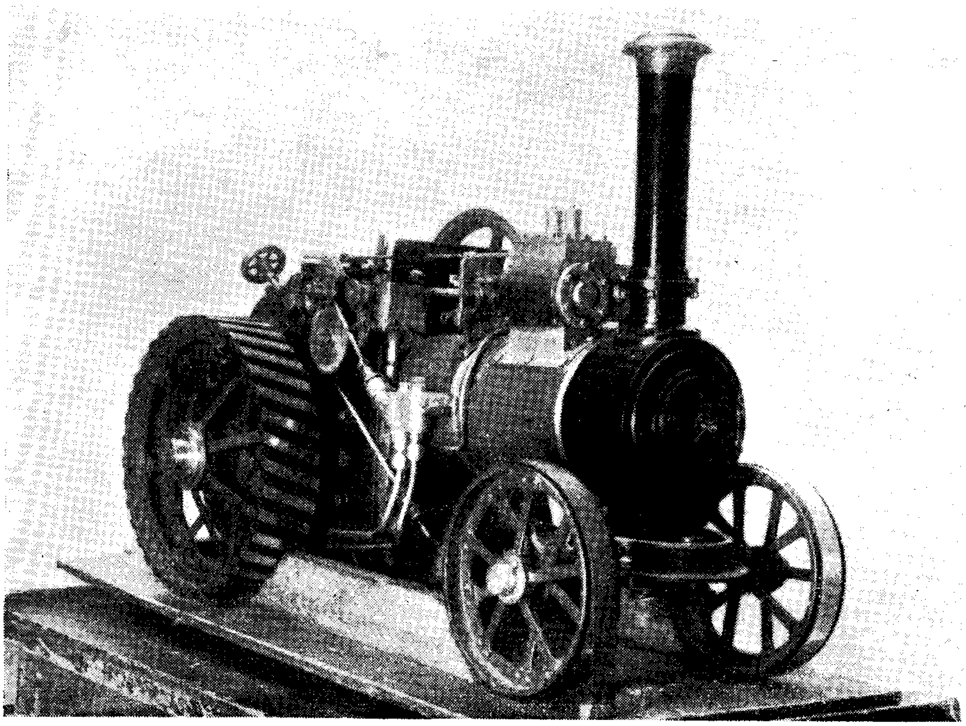
At this, their eleventh annual exhibition, no fewer than 134 models were on show and in addition, a number of trade stands, exhibiting a wide range of tools, materials and model makers' accessories. The members personally responsible for the organisation of this exhibition must have put in a great deal of hard work and planning and much credit is due to them.

In publishing some pictures selected from those taken by Messrs. Clark and Tinsley of Hucknall, we feel that it is impossible to do justice to all the models in the limited space at our disposal, but we hope, at a later date, to publish details of some of the outstanding examples of fine craftsmanship which were seen in every section of the exhibition.

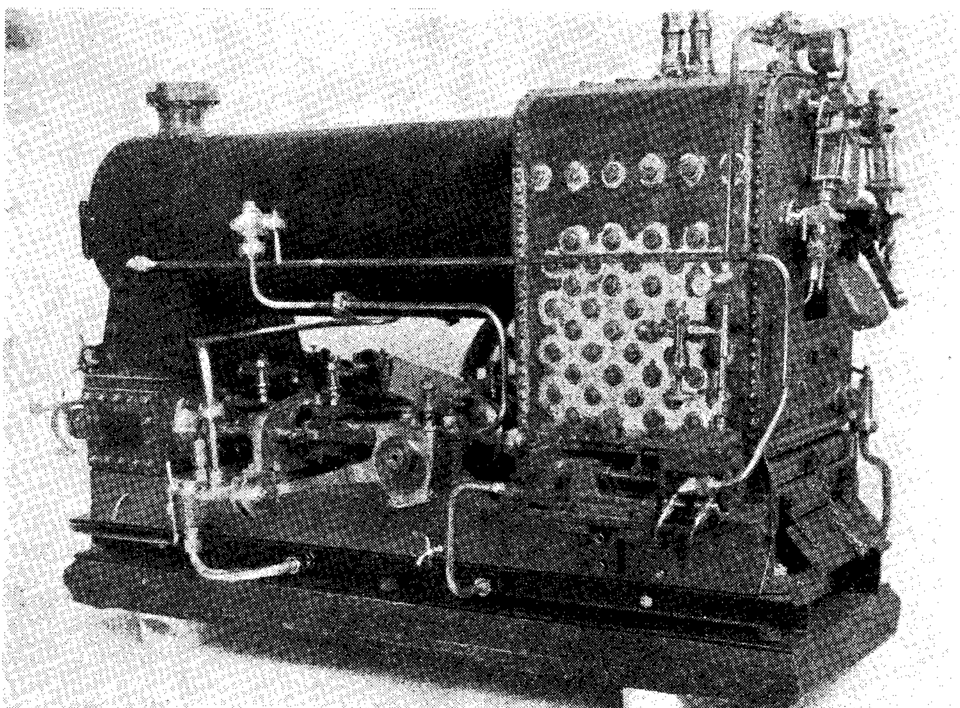
The Society's passenger-carrying track was in use throughout the show. Mr. Barke's $3\frac{1}{2}$ in. gauge "Princess Royal," Mr. Ruffle's $3\frac{1}{2}$ in. gauge "Flying Scotsman," and the Society's 5 in. 0-6-0 Goods Engine did splendid work in providing free rides for the juvenile element among the visitors. The Club's electrically operated "O" gauge track layout of 420 ft. was running most of the four days duration of the exhibition and was the object of much admiration and attention from the large crowds which it attracted.



Mr. Buck's model racing cars



Mr. W. Day's 1-in. scale traction engine



Mr. Bradley's model undertype engine

PETROL ENGINE TOPICS

* A 15-c.c. FOUR-CYLINDER ENGINE

By Edgar T. Westbury

ALTHOUGH the principles and methods employed in forming the cams are generally similar to those which were described in connection with those of the "1831" engine, the difference in detail in the two camshafts calls for some modification of the appliances used in the present case. Not only are there twice as many cams, of considerably smaller dimensions, but the method of constructing the jig for the form-machining operation is slightly different.

For the benefit of new readers who have not read previous articles on the design and production of cams, it should be explained that for some years now I have favoured the use of cams in which the contour consists of a blended series of circular arcs. Such cams are reasonably efficient, even for engines of high performance, if the curves are judiciously chosen, and work very smoothly in conjunction with plain flat-ended tappets. But their chief advantage, from the production angle, is that they may be formed, to a close limit of accuracy, by simple methods. The flank contours, which are the most critical both in respect of shape and angular position, can be machined by any method which gives a circular motion—such as by means of a dividing head or rotary table on a milling machine—but even simpler from the amateur's point of view, by plain "common or garden" turning.

The method recommended is to mount the camshaft blank (Fig. 23) in an eccentric turning fixture, so arranged as to present each cam in turn at the correct radius and angle to machine each flank to the required shape. For machining the base circle, a number of similar cuts may be taken at the same radial setting, but with a shift of one or two degrees between each cut; or as an alternative, a method of circular milling could be employed.

The nose contour of the cams would be much more difficult to machine by this method, and would call for a very elaborate method of setting up, but in this case it is possible to work fairly accurately by hand filing, checked by means of a simple template or radius gauge. As this part of the curve primarily serves the purpose of producing a smooth transition from one flank of the cam to the other, extreme accuracy is of less importance than a smooth blending of the curves.

All this may sound rather complicated to the beginner, but it is not as formidable as it seems, if tackled by sound methods; and the alternatives are no easier, and much less satisfactory. Apart from haphazard methods of cutting and "trying," which were dismissed in the previous section of these articles, the only other sound methods are (a) copy milling or filing; (b) tangential milling or filing; and (c) generating by milling processes.

Copying is a very sound method, and is quite extensively used in production practice, but it obviously calls for something to copy from; and the production of a master cam, or in this case, a complete set of master cams, all correctly positioned, is no easier than producing the actual cams directly by the methods to be described here. If one had to make a large number of cams, copy milling (or grinding) would be well worth considering; but as things stand, it does nothing to simplify practical problems.

The use of tangential cams enables forming to be done by filing in the lathe, with the aid of a roller filing rest. I have advocated this method in the past, but one disadvantage of this type of cam is that it cannot be used with a plain tappet, but demands a roller follower, or at least one having a convex working face. A flat tappet used with such a cam would cause the whole surface of the flank to engage the cam at once, with a "slapping" action which would be noisy and mechanically inefficient. It is, of course, quite easy to form a tappet with a cylindrically-curved face, but it must then be prevented from rotating, and this complicates construction in a small engine.

The generation of cam contours, which has been very ably exploited and described by Mr. D. H. Chaddock, is, perhaps, the most accurate method, especially when the cams are designed to give carefully controlled valve motion, but it calls for the working-out of an exact valve lift diagram, and means of controlling both the angular motion of the cam and the feed of the cutter to very fine limits. This method was described in the issues of THE MODEL ENGINEER dated June 9th and 23rd, 1938.

This brief dissertation on means of producing cams should at least convince readers that I have sound practical reasons for adopting the methods to be described—even if they do not agree that these methods are the best which can be devised.

The Cam Turning Jig

The jig used for forming the cams of the "1831" engine, as described in THE MODEL ENGINEER, dated September 23rd, 1941, consisted of a round bar, centred at each end, with pillars, or as they may be defined, "headstocks," to form a means of holding the camshaft parallel to the bar, at the correct distance to enable the flanks to be turned to the required radius. It would be practicable to use a somewhat similar method of construction in the present case, but the smaller flank radius limits the permissible size of bar to about 9/32 in. diameter, which is a little on the flimsy side, especially in view of the length and slenderness of the shaft to be supported. It is, therefore, considered better to use a flat or rectangular bar for the "bed" of the jig, the "headstocks" being in the form of split plummer blocks, which may be made from

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*Continued from page 556, "M.E.," May 1, 1947.

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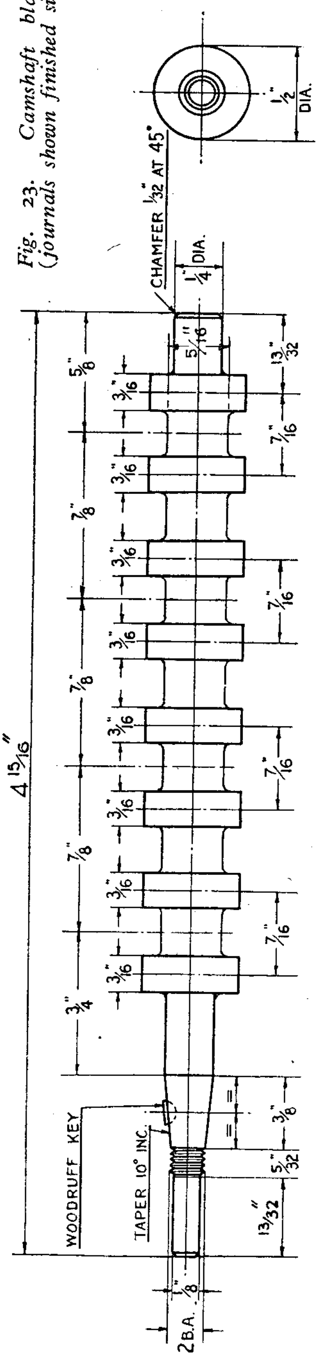


Fig. 23. Camshaft blank (journals shown finished size)

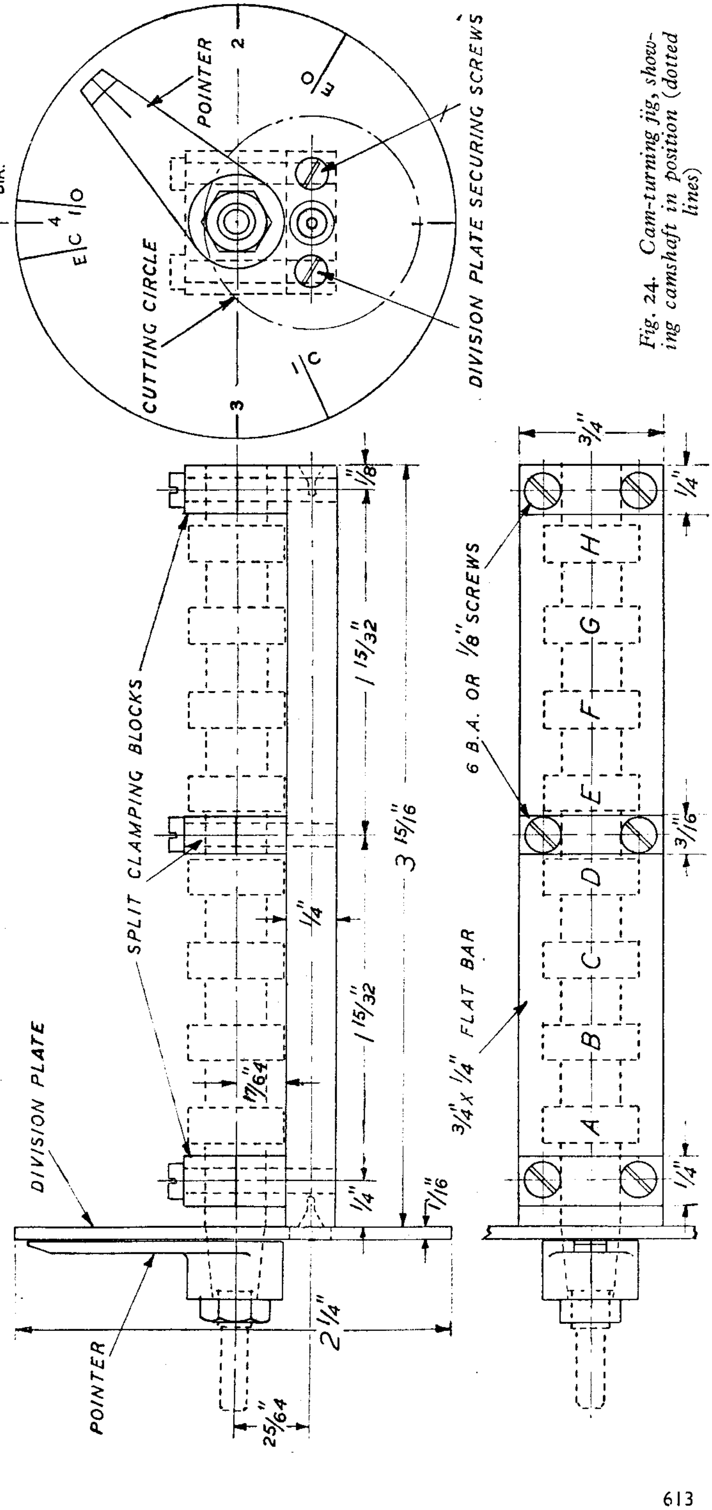


Fig. 24. Cam-turning jig, showing camshaft in position (dotted lines)

a similar section of bar, and each secured to the bed by two screws, as shown in Fig. 24. Three of these split blocks are used, the centre one being by way of a steady bearing to support the middle of the camshaft against spring.

The six pieces of bar which are used to form the three split blocks are all alike, and may be produced by parting off from the rectangular bar. If this is done carefully, very little filing or other truing of the faces will be necessary. One of the blocks may be marked out and drilled for the screw holes, then used as a jig for drilling the others. To drill the cross holes, half in each block of a particular pair, make a vee notch exactly in the centre with a three-cornered file, clamp the pair of blocks together, and drill through the intersection with a small pilot drill; then open out to slightly under finished size, to allow for reamering on assembly.

The bar to form the bed of the jig should be checked for flatness, as any "wind" will throw the blocks out of truth, after which it is carefully marked out and centre-drilled fairly deeply on each end. Clamp the lower half of each block in position on the bar, using a straight piece of silver-steel rod in each shaft seating as an alignment bar, and "spot" the tapping holes through the holes in the blocks. An identification mark should be made on each half, and also in the appropriate positions on the bed, to show their location and correct way round, when they are dismantled and subsequently reassembled.

After clamping the two end blocks in position, a reamer may be run through both to finally align and size the holes; if the shaft has been left oversize to allow of final finishing after cutting the cams, this must, of course, be allowed for in the size of the seatings. The centre seating must be finished $\frac{5}{16}$ in. diameter, to fit the shaft at this point, so if the ends of the camshaft were left at the same diameter, it would be practicable to line-reamer all three of the seatings together. A paper shim should be placed between the half-blocks to ensure that, after reamering, they may be clamped down to hold the shaft firmly. It is also practicable to use shims under the bases of the blocks, to correct any errors in the height, or radial distance of the shaft from the running centres of the bed.

In order to produce the flank radius of $\frac{9}{16}$ in.; the base circle of the cam must be $\frac{9}{16}$ in. from the jig centre, and as the diameter of the base circle is 11/32 in., the camshaft centre must be ($\frac{9}{16}$ in. — 11/64 in.) = 25/64 in. from that of the jig. If a $\frac{1}{4}$-in. bar is used for the bed of the jig, and the running centres are exactly on its centre line, the lower half-blocks must be 17/64 in. thick to bring the shaft in the correct position.

Division Plate

This is attached to one end of the jig, and consists of a plate sufficiently large in diameter to enable the cam timing diagram to be set out on it accurately. As the cams will rotate in an anti-clockwise direction (from the drive end) the marking of the plate will be in reverse, compared to the cam timing diagram shown in Fig. 21. In addition to the zero or dead centre mark on the diagram, which should be marked with the figure 1, the plate should have three other marks at 90 degree intervals, marked in order 2, 4, 3, reading in an anti-clockwise direction.

It is most important that all marks on the plate should be clear and definite; mere scratches or pencil marks are not good enough. If means are available, the plate should be indexed in the lathe and marked with a keen point tool. One need not, however, fear that an error of half a degree or so will prevent the engine from working (it is not guaranteed that the timing is the very best that could be arrived at, anyway) but it is always advisable to work as closely as one possibly can to the specified angles. Mark the valve events clearly to avoid possible risk of error.

The division plate is attached to the end face of the jig by two countersunk screws, tapped into the bar, and extra screws or dowels may also be fitted in the lower half of the split block at this end, if desired, to give further security. Note that a clearance hole for the lathe centre is provided in the plate; it may be found necessary to use a special extension centre to clear the end of the shaft or the index pointer at this end.

Index Pointer

This is attached to the camshaft, preferably by means of the shaft nut, to avoid undue projections, and should be quite firm, yet readily movable when required. The end of the pointer should either be finished to a fine and fairly acute point, or made spade-shaped and provided with a fine radial line; its length in this case should be a little less than the radius of the plate. When in position the pointer should lie close to the division plate, and its tip should be bevelled off fairly thin to avoid risk of parallax error.

Turning the Cam Flanks

With the camshaft blank in position on the jig, and the index pointer firmly fixed and set to No. 1 zero point, the jig is set between centres and means provided for engaging it with the driving pin so that it can be rotated. Tighten the screws of the plummer blocks, taking care not to shift the shaft, and then, with the lathe rotating slowly, feed in a sharp turning tool to make a mark on any one of the spaces between the cams. This mark serves as a guide for timing top dead centre on No. 1 cylinder, and the finer it is the better, so long as it is clearly visible.

Next slacken the shaft clamping screws, and turn the shaft round until the index pointer is exactly at EO on the division plate. It is best to remove the jig from the lathe so that this can be properly seen, using a lens if necessary to make sure that the pointer exactly coincides with the line. Tighten the screws, replace the jig, and all is now set for turning the first flank of the exhaust cam for No. 1 cylinder, or by reference to Fig. 22, cam A.

It is advisable to use a fairly narrow and well-raked round-nosed tool for turning the cam flanks; a wide tool is liable to foul the clamping blocks when working on the cams adjacent to them. If possible, select a tool which will keep its edge well throughout the entire operation, as it is most undesirable to have to keep changing tools; but the actual amount of cutting to be done is quite small, and no difficulty should be encountered with steel that machines reasonably

well. Assuming that the blank diameters of the cams are correct within fairly close limits, the depth of cut required to form the flank, down to the base circle, is 0.078 in., which may be measured by means of the index on the cross slide, and if possible, a limit stop should be fixed to ensure that each cam is cut to the same depth. Another way of ensuring that the depth of cut is correct is to temporarily remove the jig and turn a bar between centres to exactly $1\frac{1}{8}$ in. diameter, noting the position of the cross slide index when this size is reached. This, of course, assumes that the radial position of the camshaft on the jig is exactly correct. However, in this case also, dimensional errors are of less importance than errors in uniformity; and whatever depth of cut is taken in the first place should be adhered to closely throughout the operation.

Having cut the first flank to the required depth, the clamping screws are loosened, and the shaft rotated to bring the pointer opposite EC, when it is again clamped, and the cut repeated *on the same cam.* Next, shift the shaft to positions IO and IC in turn, and repeat the procedure on cam B. Before going further, it is advisable to take steps to ensure that the points of the cams are readily identifiable, so that in subsequent operations on the base circles there is no risk of cutting them away. The cams at this stage, will look something like the shape shown in Fig. 25, the narrow "land" being destined to become the nose of the cam; and my favourite method of marking is to apply a dab of quick-drying paint, such as spirit blue, as used for marking-out. If the reason for this is not apparent, it will be later on.

It is now necessary to turn the exhaust and inlet cam flanks for the next cylinder; but note carefully that these do not follow on in the same order, as C is the inlet and D the exhaust in this case. The timing pointer must be shifted 90 degrees for this pair of cams; to do this, loosen the clamps, turn the pointer to No. 1 zero, and re-tighten the clamps. Then loosen the pointer on the shaft, turn it to No. 2 zero, and re-tighten it. In all these moves, care should be taken to work as accurately as possible to the marks.

Operations on the second pair of cams are identical with those on the first pair, and it obviously matters little which of the two cams is dealt with first, so long as they are in their right places. Next, the pointer is again shifted 90 degrees in an anti-clockwise direction, bringing it into position for cams G and H, the inlet and exhaust respectively, for No. 4 cylinder. The final shift, to No. 3 zero, brings the pointer into position for cams E and F.

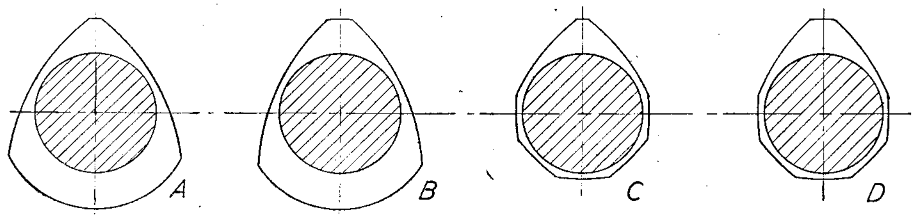


Fig. 25. (A and B). Inlet and exhaust cams after cutting flanks; (C and D). The same cams after "nibbling" base circles in five positions

It is now necessary to remove the unwanted material from the base circle, and this may be done mainly or entirely by further turning cuts, shifting the cam as required to bring the projecting portions to the top position, exact dividing not being essential in this case. Most of the metal can be removed in about five cuts, leaving the cams as shown in Fig. 25, C and D; further "nibbling" cuts at small angular intervals, obviously the more the better, will produce almost a true circle, concentric with the camshaft bearings. A mere touch with a smooth file and emery cloth is all that is necessary to complete the job.

Note that the base circle is undercut to provide tappet clearance; the amount of clearance which I have allowed may seem excessive to some constructors, but the reason is to take care of slight eccentricity which may be caused by distortion of the camshaft in hardening. Whatever amount of clearance is decided upon, however, the tool should be fed in deeper by this amount for machining the base circle, as compared to the cam flanks. To produce the "run-out" where the base circle joins the flanks, the "nibbling" cuts should be taken within about five degrees of the flank positions either way.

It now remains to finish the noses of the cams, and I have not been able to devise a simpler or more satisfactory method for this than hand filing. Radius gauges may be made by drilling holes of appropriate size in a thin piece of gauge plate (a softened carbon steel hacksaw blade is suitable) and cutting away all except the required segment of the circle. After taking off the sharp corners to approximately the required amount, and dealing in the same way with the sub-angles, a dead smooth watch pivot file should be used for finishing, using it with a rolling motion, which assists in producing a smooth, flowing curve to blend exactly with the tip and the two cam flanks. After hardening, the cam surfaces should be polished with fine emery cloth.

If this method of producing a four-cylinder camshaft appears too difficult and tedious for intending constructors, I can only say that it is the one I have found most satisfactory for achieving the desired ends with simple appliances, and as that doughty warrior of the last war but one, "Old Bill," would say—"If you knows of a better 'ole—go to it!" But don't keep the secret of this superior orifice to yourself—tell us all about it, because I, for one, should be grateful for any information which would simplify or inprove methods of producing this very important component.

(To be continued)

Editor's Correspondence

Locomotive Development

DEAR SIR,—The opening remarks of the otherwise fascinating article by Mr. Tucker about the former M. Rly. "Beatrice" in your issue of the 10th April, call for comment.

The deplorably dirty condition of the locomotives now working all British railways is largely a result of present economic and political conditions. Streamlining, however, is a technical matter around which much controversy raged before its value and special indications were established. Under certain circumstances the streamlining of high speed locomotives produces a small economy in working, which, together with other improvements in design make, in summation, a significant increase in total efficiency.

In so far as the L.N.E.R. is concerned it must be remembered that the streamlining of certain locomotives was done at the time when this company, by its pioneer work in the 'thirties, was easily able to raise regular express speeds to levels never before attained on any British railway. Whether the streamlining introduced by other companies was justified on technical grounds is another matter.

One of the remarkable things about railways that emerged during the recent war was the manner in which the specialised locomotives designed by the late Sir Nigel Gresley, and to a lesser extent the streamliners of the L.M.S., were able to handle with consummate ease the huge loads which were their daily portion. So much for streamlined dirt and ugliness.

It seems unlikely that the speeds by *steam* haulage in this country will ever again reach the level regularly maintained by the L.N.E.R. before the war, and I doubt whether we shall see more real streamliners built. From a study of constructional programmes it appears that orthodoxy and ease of maintenance will govern the future designs of all companies, excepting purely experimental work of the type now proceeding at Eastleigh which may provide the final challenge of steam to Diesel-electric traction.

Yours faithfully,

London, W.8. W. R. THROWER.

Cutting Internal Square Threads

DEAR SIR,—In reply to the letter on the cutting of internal square threads by "Plant and Maintenance," may I point out that although this can be an annoying job, adding new words to the vocabulary, it can be a simple every-day occupation provided it is tackled in the right way, with careful preparation.

First, let me point out the usual mistakes the amateur makes — the incorrect design of tool, the habit of grinding the tool to the exact width, therefore expecting it to rough and finish in one go, the incorrect speed and setting-up of the tool. For the design of the tool a piece of stock tool-steel is mounted in the four-jaw chuck and turned eccentric, leaving the usual blob on the end which is carefully filed or milled roughly to the required size and shape. One point here—another bad practice is for the residue of metal to be plunge ground and dipped in coolant so many times that the poor tip is fit for nothing, let alone doing a job of work.

The next thing is for the tool to be hardened, tempered, and then very carefully ground to size, the width of tool being about 0.005 minus. You should now have a substantial little tool of rigid design with the lip of the tool protruding from the shank 0.025 deeper than the thread to be cut, also when the tool is entered in the hole a clearance of 0.025 all round should be seen. The hole is then bored to the root diameter—0.003, which is cleaned out after screwing with a fine boring tool. This will clean out any burrs or scratches kicked up during screwing. The tool is then mounted firmly UPSIDE DOWN and presented to the work away from the operator. This you will find will eliminate the chattering and breaking of tools due to the swarf piling on top of the tool when set the opposite way, and also stops the tendency of the tool to spring up when cutting. The stop is then set for the correct depth of thread, not forgetting the 0.003 allowed in bore.

We are now ready for screwing. The headstock should run in the region of 20 r.p.m. and only light cuts taken. It is advisible after several cuts have been taken to run the tool through at the same setting, thus eliminating any tendency for the thread to taper. When the required depth is reached the tool is then moved sideways from one face to the other until the correct width of thread is formed.

This method is, of course, suitable only for the smaller threads, the larger threads needing a back rake on the tool to allow for clearance due to the increased depth of thread.

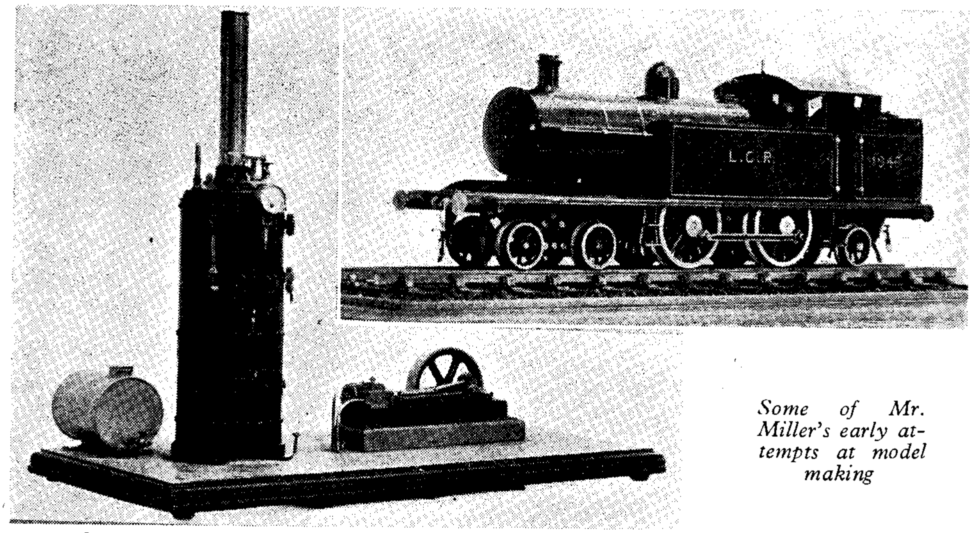
Yours faithfully,

Reading. J. M. F. LEGGE.

Model Making in India

DEAR SIR,—Although unlikely to be of any great interest I thought you might like to see the first fruits of my acquaintance with THE MODEL ENGINEER. I built the centre-flue boiler and mill engine three years ago after finding two odd copies of THE MODEL ENGINEER in the bazaar (known as "The New Market") on one of my rare visits to Calcutta.

It was made with the assistance of little more than a few hand tools and only the rivets and screws were purchased. Material for model engineering is quite unobtainable in India, and I made my own patterns and castings—most of the former with a hand fretsaw, and the latter, after many trials and tribulations, in plaster of Paris moulds. All the material used is scrap; steam pipes for instance being steel oil-line pipes from an old car. The boiler is 4 in. dia. × 11 in. long and stands 19 in. overall, and burns coal or can be fired with a Primus burner. It was made out of a bit of 4 in. W.I. pipe skimmed down to $\frac{1}{8}$ in. thickness. The engine is 8$\frac{3}{4}$ in. overall, 4 in. dia. flywheel, double-acting, bore $\frac{3}{4}$ in. × 1 in. stroke and a piston valve. The crankshaft was forged from steel bar, and was not too difficult. This, by the way, is a method I have



Some of Mr. Miller's early attempts at model making

not so far seen suggested in THE MODEL ENGINEER. The boiler feed pump (and clacks), which is to be connected to the water tank shown, is not yet completed.

As railways and locomotives have always fascinated me, needless to say I completely "fell" for "L.B.S.C." and very impatiently awaited his completion of "Petrolea" and the introduction of "Hielan' Lassie."

In the meantime I decided to get in a little practice, and built the $1\frac{1}{4}$ in. gauge 4-4-2 tank engine for my small son as seen in the photograph.

It is, I suppose, "free lance" inasmuch I made my own drawings from a photo of a Southern 4-4-2 tank model. Wheels are brass castings from my own fretsaw-cut patterns, frames, tender and tank etc. being 1/32 in. steel. Smokebox, chimney and frames are painted black and the rest, including wheels, Midland Railway red. The flanges and tyres of the wheels (being brass) were tinned to improve the colour, and the general appearance is quite successful. Since then I have made a start on "Heilan' Lassie" and as I am due for a long leave, am now eagerly awaiting reaching home to obtain the necessary additional material and tools.

I am a Mining Engineer by profession, and living in the "jungle" as I do, have to make the best of what is available and do a lot of "wangling" and improvising all the time. However, all that gives added pleasure when a problem *is* solved and an added appreciation when the proper tools and/or materials come my way.

Yours faithfully,

C. E. MILLER.

Behar, India.

Club Announcements

Stockport and District Society of Model Engineers

We held our first annual general meeting in the Dyers Club, on Friday, April 11th. Officers were elected, and the sub-committees formed to take care of track, miniature car section, aeroplanes, regattas and exhibitions. An excellent programme has been mapped out for the forthcoming season and details will be published later. Visitors and prospective members are welcome to attend any of our meetings held in The Dyers and Bleachers Club, on the first and third Fridays in each month, at 8.0 p.m.

Hon. Secretary: G. LINDSEY, 292, Bramhall Lane South, Bramhall, Stockport.

Tonbridge and District Model and Experimental Engineering Society

Saturday, April 12th, was track day, the first of the season, at E.C.D. meadows. In spite of snow, ice and flood, the track had stood the winter well and some good runs were made.

Mr. E. M. Graville had his $3\frac{1}{2}$-in. gauge "Iris," and Mr. R. H. Procter his $3\frac{1}{2}$-in. "P. V. Baker," on their steaming trials, and both models gave excellent performances. Mr. H. H. Mills brought his tried and trusty $2\frac{1}{2}$-in. "Dyak," and Mr. C. C. Langer took a film of these locomotives in action.

Hon. Secretary: C. C. LANGER, The Warren, Brenchley.

The Northern Association of Model Engineers

The following two lectures have been arranged to take place in the Houldsworth Hall, Deansgate, Manchester, at 3.0 p.m.

On Saturday, May 24th. Mr. E. T. Westbury will give a lecture illustrated by lantern slides on "The History and Development of Model Petrol Engines over the last 20 Years."

On Saturday, June 7th. Mr. J. N. Maskelyne will open a discussion on "The Influence of Scale Dimensions on Model Locomotive Design."